

July 1985

**ENLOE DAM PASSAGE PROJECT**

**VOLUME II - APPENDICES**

Annual Report 1984



DOE/BP-11902-2



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Portland, OR 97208-3621

Please include title, author, and DOE/BP number in the request.

**ENLOE DAM PASSAGE PROJECT  
ANNUAL REPORT 1984  
VOLUME II - APPENDICES**

Prepared For:

**Larry B. Everson  
Program Manager**

**BONNEVILLE POWER ADMINISTRATION  
DIVISION OF FISH AND WILDLIFE  
1002 N.E. Holladay Street  
Portland, Oregon 97232**

Project No. 83-477

Contract No. DE-AC79-83BP11902

Prepared By:

**M.L. Fanning  
Project Manager**

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3711.1

July, 1985





**DISTRIBUTION LIST  
FOR ENLOE DAM PASSAGE PROGRESS REPORT  
MEASURE 704 (e) (1) TABLE 5 (A)  
SEPTEMBER, 1984**

U.S. Federal Agencies and Councils

K. Colbo, Chairman, Northwest Power Planning Council  
J. Chrisman, Director, Northwest Power Planning Council  
M. Schneider, Northwest Power Planning Council  
J. Palensky, Bonneville Power Administration  
G. Drais, Bonneville Power Administration  
P. Majkut, Bonneville Power Administration  
R. Wilkerson, Bonneville Power Administration  
D. Turpin, Bonneville Power Administration  
Q. Edson, Federal Energy Regulatory Commission  
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K. Bauersfeld, Washington Department of Fisheries  
E. Garling, Washington Department of Ecology  
S. Mitchell, Washington Department of Ecology

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A. Brummet, B.C. Minister of Environment  
B. Marr, B.C. Deputy Minister of Environment  
D. Narver, Acting Director, B.C. Fisheries Branch  
H. Sparrow, B.C. Fisheries Branch  
G. Taylor, B.C. Fisheries Branch  
C. Bull, B.C. Fisheries Branch  
L. Sunde, B.C. Fisheries Branch  
R. Thomas, B.C. Fisheries Branch  
I. Withler, B.C. Fisheries Branch  
J. O'Riordan, B.C. Planning and Resource Management Division

### Canadian Government

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W. Shiners, Director General, Pacific Region, Fisheries and Oceans Canada  
F. Fraser, Fisheries and Oceans Canada  
G. Hoskins, Fisheries and Oceans Canada  
B. Shepherd, Fisheries and Oceans Canada  
T. Carey, Fisheries and Oceans Canada

### Indian Tribes

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B. Tuck, Yakima Tribal Council  
L. Hatcher, Yakima Tribal Council  
A. Aubertin, Chairman, Colville Tribal Council  
G. Marco, Colville Tribal Council  
J. Smith, Colville Indian Reservation  
T. Wapato, Director, Columbia River Inter-tribal Fish Commission  
R. Lothrop, Columbia River Inter-tribal Fish Commission  
D. Dompier, Columbia River Inter-tribal Fish Commission  
A. Heindle, Columbia River Inter-tribal Fish Commission  
E. Allison, Chief, Upper Similkameen Band  
B. Allison, Chief, Lower Similkameen Band

### Public

H. Warner, Manager, Okanogan County PUD  
F. Lieberg, Manager, Douglas County PUD  
M. Erho, Douglas County PUD  
A. Wright, Grant County PUD  
H. Shaw, Penticton Flyfishers  
M. Turner, Save Our Similkameen



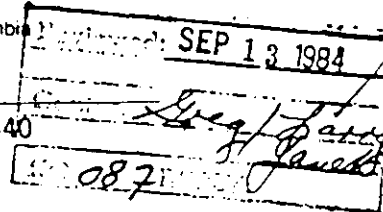
APPENDIX 1

Minutes of Meetings and Correspondence  
Subsequent to the September 1984  
Progress Report





File: 0440



September 4, 1984

Mr. John Palensky, Director  
Division of Fish and Wildlife  
Bonneville Power Administration  
P.O. Box 3621  
Portland, Oregon 97208

Dear Mr. Palensky:

Re: The British Columbia View of the Similkameen Proposal

Over the last several years we have discussed the Similkameen River proposal in the Columbia River Fish and Wildlife Program with Bonneville Power Administration, Northwest Power Planning Council, and various state, federal and Indian agencies. In this letter I want to reaffirm our general position on the proposal and comment specifically on two issues: fish passage at Enloe Dam and the risk of fish diseases.

Generally speaking we are receptive to the proposal to put summer steelhead in the Canadian portion of the Similkameen River. In May of 1983, Mr. B.E. Marr, Deputy Minister of Environment, expressed this general support along with some concerns to Mr. D. Evans, Chairman of the Northwest Power Planning Council. The concerns identified by Mr. Marr included the maintenance of instream flows, the impact of anadromous stocks on our resident trout program, and the assured allocation of returning adult fish to anglers in British Columbia.

At present it is not established that the Wells Hatchery steelhead stock will provide a September-October fishery in the Similkameen above Enloe Dam. If the adult fish overwinter in the Columbia or the Okanogan River in Washington and enter British Columbia waters only in the spring to spawn, then we are not particularly interested in the proposal. In this situation we would be assuming risks (disease) and costs (reduced resident populations) exclusively for downstream non-Canadians' benefit. The jury is still out on adult migratory behaviour, but the 1+ ocean fish returning this fall as a result of Washington Department of Game's large smolt plant at Enloe in 1983 will provide considerable evidence. I hope you will ensure appropriate monitoring of these fish.

...2

Over the past month or two I have been contacted about our agency's preferred mode of adult fish passage at Enloe. At this time the only acceptable passage would be trap and truck. This provides full control of escapement, opportunity for disease assessment, full evaluation of the project, and appropriate distribution of fish within the system. If the program is judged a success in terms of adult returns, a less labour-intensive mode of passage could be considered (dam removal or fishway).

We have a major concern about the risk of introducing infectious diseases not present in British Columbia. Our federal and provincial fish culture operations, as well as a developing fish farming and mariculture industry, are vulnerable. These risks were discussed at length last spring with B.P.A. consultants and fish health authorities. I enclose a letter from Mr. Gary Hoskins who attended that meeting and is one of three Local Fish Health Officers in British Columbia.

The Fish Health Regulations under the Canada Fisheries Act are extremely strict on the importation of live fish. Essentially, only a Local Fish Health Officer under the Regulations can issue an Import Permit. Fish under such permit must come from a Certified (disease free) Facility under the Act.

The best avenue in satisfying our Fish Health Regulations and Mr. Hoskins' concerns is to develop a quarantine section at the Wells Hatchery. It has been established that the Wells summer steelhead is the only available/acceptable stock. I have recently learned that an expansion at Wells is planned for the near future. The fact that Wells has ample ground water means that it would be relatively easy to develop a quarantine section that was Certifiable under the Canada Fisheries Act.

In summary, we are supportive of your proposal to introduce summer steelhead above Enloe Dam provided that British Columbia anglers have fish available to them in September and October and that the risk of disease introductions is minimized. This Ministry cannot accept a passive mode of fish passage at Enloe such as dam removal or laddering; for the reasons noted above we require a trap and truck operation for the initial or evaluation stages of the project. The project cannot go ahead unless the Canadian Fish Health Regulations under the Fisheries Act are satisfied, and this can best be accomplished by a quarantine section at Wells Hatchery using ground water.



I hope this sets out our position clearly. If you or your staff have questions or want further information, please contact me.

Yours truly,



David W. Narver  
Acting Director  
Fisheries Branch

DWN:ec

Encl.

c.c. Dale Evans, National Marine Fisheries Service  
L. Phinney, Washington Dept. of Fisheries  
Sam Wright, Washington Dept. of Game  
Ms. J. Chrisman, Northwest Power Planning Council  
J.W. Keys, Bureau of Reclamation  
I.R. Withler, B.C. Fisheries Branch  
Chris Bull, B.C. Fisheries Branch  
R.C. Thomas, B.C. Fisheries Branch  
L. Sunde, B.C. Fisheries Branch  
R.A.H. Sparrow, B.C. Fisheries Branch  
Gary Hoskins, Pacific Biological Station  
J. O'Riordan, B.C. Planning & Resource Management Div.  
Len Fanning, I.E.C. Beak  
G. Taylor, B.C. Fisheries Branch  
F. Fraser, Dept. of Fisheries and Oceans

PJS

OCT 22 1984

Area Director  
U.S. Bureau of Indian Affairs  
P.O. Box 3785  
Portland, OR 97208

Attention: Environmental Officer

The Northwest Power Planning Council, in Measure 704(e)(1), Table 5(A), of the Columbia River Basin Fish and Wildlife Program, has stipulated that Bonneville Power Administration (BPA) should provide funding for establishment of anadromous fish passage at Enloe Dam on the Similkameen River T40R, R26E, Section 13, located 3 1/2 miles northwest of Oroville, Washington. In initiating compliance with this request, BPA has contracted with IEC Beak Consultants Ltd., to undertake a multiphase program including gathering and evaluating existing environmental information on the Enloe Dam area.


Phase I of IEC Beak's contract was conducted between August and October of 1983 with the main objectives of the studies being: (1) to conduct a habitat assessment of the mainstem Similkameen River and its major tributaries upstream of Enloe Dam in Washington and throughout the basin in British Columbia, (2) to conduct an inventory of the system's resident fish populations, (3) to estimate the quantity of spawning and rearing area available for steelhead trout and chinook salmon; and (4) to estimate the system's potential steelhead trout and chinook salmon smolt production; and (5) to describe the hydrology and general water quality of the Similkameen River Basin as it relates to fish production.

Phase II of IEC Beak's contract has recently been initiated. The objective of this phase shall be to determine the most efficient and cost-effective means for providing fish passage around Enloe Dam. Three alternatives are being investigated to provide passage for adult anadromous fish around Enloe Dam. These alternatives are: (1) dam removal; (2) fish ladder addition; and (3) trap and haul. IEC Beak will provide BPA with an environmental report as a final product of their studies. This report will detail the proposed conceptual design requirements and also the NEPA compliance issues for the three passage alternatives.

IEC Beak will be establishing contact with appropriate agencies and organizations who have knowledge of environmental issues regarding Enloe Dam. Your organization has been recommended as a potential information source for this study. If you know of published or unpublished work which could be referenced in this study or other people who should be contacted, please make the IEC Beak representative aware of this information when he/she contacts your organization.

An Enloe Dam project backgrounder is enclosed for your information. If you have any further questions about BPA's Enloe Dam environmental information gathering and evaluation effort, please call Kevin Ward, Environmental Specialist, at (503) 230-5213 (FTS 429-5213). Thank you for working with us and IEC Beak to develop a comprehensive environmental report on Enloe Dam's anadromous fish passage project.

Sincerely,



John Palensky, Director  
Division of Fish and Wildlife

Enclosure

RHayden:rh (WP-PGC-4331N/3133K)

bcc:

R. Hayden - PGC  
G. Draais - PJS  
L. Everson - PJS  
K. Ward - PJS  
Official File - PJ  
Project File - PJS

(Same letter sent to those on attached list)

ENLOE DAM PROJECT BACKGROUNDER

In the fall of 1905, the Similkameen Falls Power and Development Company acquired the water rights to the Similkameen River. However, it was not until between 1916 and 1923 that the 54-foot-high Enloe Dam and hydroelectric facility were constructed by the Okanogan Valley Power Company at river mile 8.8. The rights of this company were subsequently transferred to the Okanogan Public Utility District, the present owner of the dam. Power was generated from the facility until 1959, at which time its operation was deemed economically unfeasible. In 1978, Enloe Dam and its powerhouse were listed on the National Register of Historic Sites.

Since Enloe Dam was not provided with fish passage facilities, discussions among the various Canadian and U.S. agencies on providing passage have occurred since the 1920's, without success. To effect action, the Northwest Power Planning Council in its Columbia River Basin Fish and Wildlife Program recommended that the Bonneville Power Administration (BPA) provide funding for removal or laddering of Enloe Dam. This action would establish access for anadromous salmonids to many miles of spawning and rearing habitat in the upper Similkameen River watershed. It has been estimated that the river above the dam has the potential to produce 610,000 steelhead trout smolts and over 1.6 million chinook salmon smolts. Completion of Enloe Dam passage and establishment of an anadromous fish run throughout the Similkameen River Basin would be considered as offsite mitigation for juvenile fish losses occurring on the mainstem Columbia River.

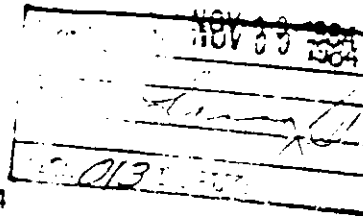
To date, it has not been proven whether or not anadromous fish were able to migrate upstream beyond the dam site prior to its construction. A natural waterfall which still exists a short distance downstream of the dam is claimed to have always been a fish barrier, and that anadromous fish did not exist above it. Others, however, maintain that chinook, coho, and sockeye salmon and steelhead trout did exist above the dam site prior to its construction.



# United States Department of the Interior

## BUREAU OF MINES

WESTERN FIELD OPERATIONS CENTER  
EAST 360 3RD AVENUE  
SPOKANE, WASHINGTON 99202



November 6, 1984

Mr. John R. Palensky  
Director  
Division of Fish and Wildlife  
Department of Energy  
Bonneville Power Administration  
P.O. Box 3621  
Portland, Oregon 97208

Dear Mr. Palensky:

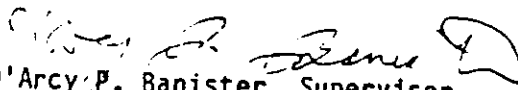
SUBJECT: FISH PASSAGE AROUND ENLOE DAM ON THE SIMILKAMEEN RIVER  
OROVILLE, WASHINGTON

Your letter of October 22, 1984, requested published work that could be referenced in this study. We suggest Washington State Bulletin No. 37, Inventory of Washington Minerals, Part II, Metallic Minerals, page 188. This publication reports a high-grade gold placer deposit at Similkameen Falls downstream from the dam. That publication is referenced from the U.S. Geological Survey Mineral Resources publication of 1905, "Useful Minerals in the Black Sands of the Pacific Slope."

Destruction of this dam could produce an interest in gold placer mining in that section of the river. A significant placer gold deposit may exist beneath the dam and the reservoir.

We hope this helps; should any questions arise, please contact this office at your convenience.

Sincerely,

  
D'Arcy P. Banister, Supervisor  
Minerals Involvement Section.



# United States Department of the Interior

## BUREAU OF LAND MANAGEMENT

### OREGON STATE OFFICE

825 NE Multnomah Street

P.O. Box 2965

Portland, Oregon 97208

IN REPLY WITH FILE	
OR 17434 (W)	2320 (943.4)
NOV 28 1984	Your Reference
PN 420	720
400	130
426	123
200	
NOV 28 1984	
FILE	

#### Memorandum

To: Regional Director, Bureau of Reclamation  
P.O. Box 043, Boise, Idaho 83724

From: Chief, Branch of Lands and Minerals Operations

Subject: Application for Reclamation Withdrawal OR 17434 (Wash),  
Oroville-Tonasket Unit Extension, Okanogan County, Washington

In your letter of July 21, 1983, you stated that a study is being conducted on the anadromous fishery potential of the upper Similkameen River and that the requirements for use of the land included in the subject withdrawal application will be based on such study. You also indicated that the withdrawal application should be held in abeyance for a period of about one year.

Withdrawal application OR 17434 (Wash) has been pending since May 5, 1977, and we have determined that it cannot be processed for approval because it does not meet the requirements of the regulations contained in 43 CFR Part 2300 (see enclosed Circular No. 2484). We recommend that your application be cancelled or denied for the following reasons:

1. You have not submitted the documentation required by 43 CFR 2310.1-2 and 2310.3-2.
2. The land included in your application has been conveyed from Federal ownership pursuant to the Recreation and Public Purposes Act of June 14, 1926, as amended (43 U.S.C. 869 et seq.). A formal withdrawal could only segregate the reserved mineral estate, but could not transfer jurisdiction of the surface estate to the Bureau of Reclamation. Therefore, the surface estate could not be utilized by the Bureau of Reclamation for the purposes identified in the withdrawal application.

The controversy involving proper use of the land by the Public Utility District No. 1 of Okanogan County has not been resolved. If in the event title to the land reverts to the United States at some time in the future, the Bureau of Reclamation could initiate a new withdrawal petition/application without prejudice. The present withdrawal application secures no rights or interests in the land by the Bureau of Reclamation.

In view of the above, we suggest that the Bureau of Reclamation cancel withdrawal application OR 17434 (Wash) by written notice to this office.

As provided by 43 CFR 2310.3-2(f)(1), within 30 days from the date of your receipt of this letter, you may submit written objections to our findings and recommendations and request further review by the Director of the Bureau of Land Management.

The Bureau of Land Management is attempting to eliminate a large backlog of pending withdrawal applications. Your continued cooperation is appreciated.

*Harold A. Berends*

Enclosure

cc:  
DM, Spokane

DEPARTMENT OF THE INTERIOR

Bureau of Land Management

[Circular No. 2484]

43 CFR PARTS 2090, 2300, 2310, 2320,  
2340 and 2350

Federal Land Withdrawals;  
Amendment to Withdrawal Procedures

Under the authority of section 204 of the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1714), the Federal Power Act of 1920 (16 U.S.C. 818), the Act of February 28, 1958 (43 U.S.C. 155 et seq.), section 1326(a) of the Alaska National Interest Lands Conservation Act (Pub. L. 96-487), and Executive Order 10355 (17 FR 4831), Group 2300, Subchapter B, Chapter II, Title 43 of the Code of Federal Regulations is revised as set forth below.

1. Part 2300 is revised as follows:

**PART 2300—LAND WITHDRAWALS**

**Subpart 2300—Withdrawals, General**

**Sec.**

- 2300.0-1 Purpose.
- 2300.0-3 Authority.
- 2300.0-5 Definitions.

**Subpart 2310—Withdrawals, General—Procedure**

- 2310.1 Procedures—general.
- 2310.1-1 Preapplication consultation.
- 2310.1-2 Submission of applications.
- 2310.1-3 Submission of withdrawal petitions.
- 2310.1-4 Cancellation of withdrawal applications or withdrawal proposals and denial of applications.
- 2310.2 Segregative effect of withdrawal applications or withdrawal proposals.
- 2310.2-1 Termination of segregative effect of withdrawal applications or withdrawal proposals.
- 2310.3 Action on withdrawal applications and withdrawal proposals, except for emergency withdrawals.
- 2310.3-1 Publication and public meeting requirements.
- 2310.3-2 Development and processing of the case file for submission to the Secretary.
- 2310.3-3 Action by the Secretary—public land orders and notices of denial.
- 2310.3-4 Duration of withdrawals.
- 2310.3-5 Compensation for improvements.
- 2310.3-6 Transfer of jurisdiction.
- 2310.4 Review and extension of withdrawals.
- 2310.5 Special action on emergency withdrawals.

**Subpart 2320—Federal Energy Regulatory Commission Withdrawals**

- 2320.0-3 Authority.
- 2320.1 Lands considered withdrawn or classified for power purposes.
- 2320.2 General determinations under the Federal Power Act.

Authority: 43 U.S.C. 1201; 43 U.S.C. 1740; Executive Order No. 10355 (17 FR 4831, 4833).

**Group 2300—Withdrawals**

**PART 2300—WITHDRAWALS**

**Subpart 2300—Withdrawals, General**

**§ 2300.0-1 Purpose.**

(a) These regulations set forth procedures implementing the Secretary of the Interior's authority to process Federal land withdrawal applications and, where appropriate, to make, modify or extend Federal land withdrawals. Procedures for making emergency withdrawals are also included.

(b) The regulations do not apply to withdrawals that are made by the Secretary of the Interior pursuant to an act of Congress which directs the issuance of an order by the Secretary. Likewise, procedures applicable to withdrawals authorized under the Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1272(b); 1281), and procedures relating to the Secretary's authority to establish Indian reservations or to add lands to the reservations pursuant to special legislation or in accordance with section 7 of the Act of June 18, 1934 (25 U.S.C. 467), as supplemented by section 1 of the Act of May 1, 1936 (25 U.S.C. 473a), are not included in these regulations.

(c) General procedures relating to the processing of revocation of withdrawals and relating to the relinquishment of reserved Federal land areas are not included in this Part.

**§ 2300.0-3 Authority.**

(a)(1) Section 204 of the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1714) gives the Secretary of the Interior general authority to make, modify, extend or revoke withdrawals, but only in accordance with the provisions and limitations of that section. Among other limitations, the Federal Land Policy and Management Act of 1976 provides that the Secretary of the Interior does not have authority to:

(i) Make, modify or revoke any withdrawal created by an Act of Congress;

(ii) Make a withdrawal which can be made only by an Act of Congress;

(iii) Modify or revoke any withdrawal creating national monuments under the Act of June 8, 1906 (16 U.S.C. 431-433), sometimes referred to as the Antiquities

Act;

(iv) Modify or revoke any withdrawal which added lands to the National Wildlife Refuge System prior to October 21, 1976, the date of approval of the Federal Land Policy and Management Act of 1976 or which thereafter adds lands to that System under the terms of that Act. In this connection, nothing in the Federal Land Policy and Management Act of 1976 is intended to modify or change any provision of the Act of February 27, 1976 (16 U.S.C. 668 d(a)).

(2) Executive Order 10355 of May 26, 1952 (17 FR 4831), confers on the Secretary of the Interior all of the delegable authority of the President to make, modify and revoke withdrawals and reservations with respect to lands of the public domain and other lands owned and controlled by the United States in the continental United States or Alaska.

(3) The Act of February 28, 1952 (43 U.S.C. 155-158), sometimes referred to as the Engle Act, places on the Secretary of the Interior the responsibility to process Department of Defense applications for national defense withdrawals, reservations or restrictions aggregating 5,000 acres or more for any one project or facility. These withdrawals, reservations or restrictions may only be made by an act of Congress, except in time of war or national emergency declared by the President or the Congress and except as otherwise expressly provided in the Act of February 28, 1952.

(4) Section 302(b) of the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1702(b)) authorizes the Secretary of the Interior to regulate the management of the public lands as defined in the Act through instruments, such as memorandum of understanding, which the Secretary deems appropriate.

(5) Section 1326(a) of the Alaska National Interest Lands Conservation Act (Pub. L. 96-487), authorizes the President and the Secretary to make withdrawals exceeding 5,000 acres, in the aggregate, in the State of Alaska subject to the provisions that such withdrawals shall not become effective until notice is provided in the Federal Register and to both Houses of the Congress and such withdrawals shall terminate unless Congress passes a Joint Resolution of approval within one year.

Published in 46 F.R. January 19, 1981 - Effective April 15, 1981.

Circular Distribution List



after the notice of withdrawal has been submitted to the Congress.

(b) The following references do not afford either withdrawal application processing or withdrawal authority but are provided as background information.

(1) Executive Order 6910 of November 29, 1934, and Executive Order 6964 of February 5, 1935, as modified, withdrew suitable portions of the public lands for classification and conservation. These lands and the grazing districts established under the Taylor Grazing Act of 1934, as amended, are subject to the classification and opening procedures of section 7 of the Taylor Grazing Act of June 28, 1934, as amended (43 U.S.C. 315f); however, they are not closed to the operation of the mining or mineral leasing laws unless separately withdrawn or reserved, classified for retention from disposal, or precluded from mineral leasing or mining location under other authority.

(2) The Classification and Multiple Use Act of September 19, 1964 (43 U.S.C. 1411-1418), authorized the Secretary of the Interior to classify, in appropriate cases, public lands and other Federal lands exclusively administered by the Secretary of the Interior through the Bureau of Land Management for retention or disposal under Federal ownership and management. Numerous classification decisions based upon this statutory authority were made by the Secretary of the Interior. For the effect of these classification with regard to the disposal and leasing laws of the United States, see Subparts 2440 and 2461 of this title.

(3) Section 202 of the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1712) provides for land use planning and resultant management decisions which may operate to totally eliminate a particular land use, including one or more "principal or major uses," as defined in the Act. Withdrawals made pursuant to section 204 of the Federal Land Policy and Management Act of 1976 may be used in appropriate cases, to carry out management decisions, except that "public lands," as defined in the Act, can be removed from or restored to the operation of the Mining Law of 1920, as amended, or transferred to another department, agency or office, only by withdrawal action pursuant to section 204 of the Federal Land Policy and Management Act of 1976 or other action pursuant to applicable law.

(4) The first proviso of section 302(b) of the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1732(b)) provides, in part, that unless otherwise provided for by law, the Secretary of the Interior may permit Federal departments and agencies to use, occupy and develop public lands only through rights-of-way under section 507 of the Act (43 U.S.C. 1767); withdrawals under section 204 of the

Act (43 U.S.C. 1714); and, where the proposed use and development are similar or closely related to the programs of the Secretary for the public lands involved, cooperative agreements under section 307(b) of the Act (43 U.S.C. 1737(b)).

(5) Section 701(c) of the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701 note) provides that all withdrawals, reservations, classifications and designations in effect on October 21, 1976, the effective date of the Act, shall remain in full force and effect until modified under the provisions of the Act or other applicable law.

#### § 2300.0-5 Definitions.

As used in this part, the term:

(a) "Secretary" means the Secretary of the Interior or a secretarial officer subordinate to the Secretary who has been appointed by the President by and with the advice and consent of the Senate and to whom has been delegated the authority of the Secretary to perform the duties described in this part to be performed by the "Secretary."

(b) "Authorized officer" means any employee of the Bureau of Land Management to whom has been delegated the authority to perform the duties described in this part to be performed by the "authorized officer."

(c) "Act" means the Federal Land Policy and Management Act of 1976, as amended (43 U.S.C. 1701 et seq.), unless otherwise specified.

(d) "Lands" includes both upland and submerged land areas and any right or interest in such areas. To the extent provided in section 1 of the Act of February 28, 1936 (43 U.S.C. 155), the term also includes offshore waters.

(e) "Cultural resources" means those fragile and nonrenewable physical remains of human activity found in districts, sites, structures, burial mounds, petroglyphs, artifacts, objects, ruins, works of art, architecture or natural settings or features which were important to prehistoric, historic or other land and resource use events.

(f) "Archeological areas/resources" means sites or areas containing important evidence or the physical remains of former but now extinct cultural groups, their skeletons, settlements, implements, artifacts, monuments and inscriptions.

(g) "Land source use" means a land use having as its primary objective the preservation, conservation, enhancement or development of:

(1) Any renewable or nonrenewable natural resource indigenous to a particular land area, including, but not limited to, mineral, timber, forage, water, fish or wildlife resources, or

(2) Any resource value associated with a particular land area, including, but not limited to, watershed, power, scenic, wilderness, clean air or

recreational values. The term does not include military or other governmental activities requiring land sites only as an incidental means to achieving an end not related primarily to the preservation, conservation, enhancement or development of natural resources or resource values indigenous to or associated with a particular land area.

(h) "Withdrawal" means withholding an area of Federal land from settlement, sale, location, or entry under some or all of the general land laws, for the purpose of limiting activities under those laws in order to maintain other public values in the area or reserving the area for a particular public purpose or program; or transferring jurisdiction over an area of Federal land, other than "property" governed by the Federal Property and Administrative Services Act (40 U.S.C. 472), from one department, bureau or agency to another department, bureau or agency.

(i) "Department" means a unit of the Executive branch of the Federal Government which is headed by a member of the President's Cabinet.

(j) "Agency" means a unit of the Executive branch of the Federal Government which is not within a Department.

(k) "Office" means an office or bureau of the Department of the Interior.

(l) "Applicant" means any Federal department, agency or office.

(m) "Segregation" means the removal for a limited period, subject to valid existing rights, of a specified area of the public lands from the operation of the public land laws, including the mining laws, pursuant to the exercise by the Secretary of regulatory authority to assure for the orderly administration of the public lands.

(n) "Legal description" means a written land description based upon

either an approved and filed Federal land survey executed as a part of the United States Public Land Survey System or, where specifically authorized under Federal law, upon a protraction diagram. In the absence of the foregoing, the term means a written description, approved by the authorized officer, which defines the exterior boundaries of a tract of land by reference to a metes and bounds survey or natural or other monuments.

(o) "Modify" or "modification" does not include, for the purposes of section 204 of the Act (43 U.S.C. 1714), the addition of lands to an existing withdrawal or the partial revocation of a withdrawal.

(p) "Withdrawal petition" means a request, originated within the Department of the Interior and submitted to the Secretary, to file an application for withdrawal.

(q) "Withdrawal proposal" means a withdrawal petition approved by the Secretary.

Subpart 2310—Withdrawals, General—  
Procedure

§ 2310.1 Procedures—general.

(a) The basic steps leading up to the making, modification or extension of a withdrawal, except emergency withdrawals, are:

(1) Preapplication consultation;

(2) Obtaining Secretarial approval of a withdrawal petition in appropriate cases;

(3) Submission for filing of an application for a requested withdrawal action;

(4) Publication in the Federal Register of a notice stating that a withdrawal proposal has been made or that an application has been submitted for filing;

(5) Negotiations between the applicant and the authorized officer as well as the accomplishment of investigations, studies and analyses which may be required to process an application;

(6) Preparation of the case file to be considered by the Secretary, including the authorized officer's findings and recommendations;

(7) Transmittal of the case file to the Director, Bureau of Land Management, for the Director's review and decision regarding the findings and recommendations of the authorized officer;

(8) Transmittal of the case file to the Secretary;

(9) Publication of a public land order or a notice of denial signed by the Secretary. If the application seeks a national defense withdrawal that may only be made by an act of Congress, the Secretary will transmit to the Congress proposed legislation along with the Secretary's recommendations, and documentation relating thereto.

§ 2310.1-1 Preapplication consultation.

A potential applicant should contact the appropriate State office of the Bureau of Land Management well in advance of the anticipated submission date of an application. Early consultation can familiarize the potential applicant with the responsibilities of an applicant, the authorized officer and the Secretary. Early consultation also will assist in determining the need for a withdrawal, taking possible alternatives into account, increase the likelihood that the applicant's needs will be considered in current land use planning, assist in determining the extent to which any public lands that may be involved would have to be segregated if an application is submitted, and result in preliminary determinations regarding the scheduling of various investigations, studies, analyses, public meetings and negotiations that may be required for a withdrawal. Studies and analyses should be programmed to ensure their completion in sufficient time to allow

the Secretary or the Congress adequate time to act on the application before the expiration of the segregation period.

§ 2310.1-2 Submission of applications.

(a) Applications for the making, modification or extension of a withdrawal shall be submitted for filing, in duplicate, in the proper Bureau of Land Management office, as set forth in § 1821.2-1 of this title, except for emergency withdrawal requests and applications that are classified for national security reasons. Requests for emergency withdrawals and applications that are classified for national security reasons shall be submitted, in duplicate, in the Office of the Secretary, Department of the Interior, Washington, D.C. 20240.

(b) Before the authorized officer can take action on a withdrawal proposal, a withdrawal application in support thereof shall be submitted. The application may be submitted simultaneously with the making of a withdrawal proposal, in which case only the notice required by § 2310.3-1(a) of this title, referencing both the application and the withdrawal proposal, shall be published.

(c) No specific form is required, but, except as otherwise provided in § 2310.3-6(b) of this title, the application shall contain at least the following information:

(1) The name and address of the applicant. Where the organization intending to use the lands is different from the applicant, the name and address of such using agency shall also be included.

(2) If the applicant is a department or agency other than the Department of the Interior or an office thereof, a statement of the delegation or delegations of authority of the official acting on behalf of the department or agency submitting the application, substantiating that the official is empowered to act on behalf of the head of the department or agency in connection with all matters pertaining to the application.

(3) If the lands which are subject to an application are wholly or partially under the administration of any department or agency other than the Department of the Interior, the Secretary shall make or modify a withdrawal only with the consent of the head of the department or agency concerned, except in the case of an emergency withdrawal. In such case, a copy of the written consent shall accompany the application. The requirements of section (e) of Executive Order 10355 (17 FR 4931), shall be complied with in those instances where the Order applies.

(4) The type of withdrawal action that is being requested (See § 2300.0-3(h) of this title) and whether the application pertains to the making, extension or modification of a withdrawal.

(5) A description of the lands involved in the application, which shall consist of

the following:

(i) A legal description of the entire land area that falls within the exterior boundaries of the affected area and total acreage of such lands;

(ii) A legal description of the lands Federal or otherwise, within the exterior boundaries that are to be excepted from the requested action, and after deducting the total acreage of all the excepted lands, the net remaining acreage of all Federal lands (as well as all non-Federal lands which, if they should be returned to or should pass Federal ownership, would become subject to the withdrawal) within exterior boundaries of the affected areas;

(iii) In the case of a national defense withdrawal which can only be made by an act of Congress, sections 112 and 157 (2), (3) of the Act of February 28, 1958 (43 U.S.C. 157 (2), (3)) shall be complied with in lieu of subparagraphs (5) (i) and (ii) of this paragraph.

(6) If the application is for a withdrawal that would overlap, or that would add lands to one or more existing withdrawals, the application shall also contain:

(i) An identification of each of the existing withdrawals, including the project name, if any; the date of the withdrawal order, the number and type of order, if known, or, in lieu of the foregoing, a copy of the order;

(ii) As to each existing withdrawal that would be overlapped by the requested withdrawal, the total area and a legal description of the area that would be overlapped; and

(iii) The total acreage, Federal or otherwise, that would be added to the existing withdrawal, if the new application is allowed.

(7) The public purpose or statutory program for which the lands would be withdrawn. If the purpose or program for which the lands would be withdrawn is classified for national security reasons, a statement to that effect shall be included; but, if at all possible, a general description of the use to which the lands would be devoted, if the requested withdrawal is allowed, should be included. In the case of applications that are not classified for national security reasons, an analysis of the manner in which the lands as well as their natural resources and resource values would be used to implement the purpose or program shall be provided.

(8) The extent to which the lands requested to be withheld from settlement, sale, location or entry under the public land laws, including the mining laws, together with the extent to which, and the time during which, the lands involved in the application would be temporarily segregated in accordance with § 2310.2 of this title.

(9) The type of temporary land use that, at the discretion of the authorized officer, may be permitted or allowed

during the segregation period, in accordance with § 2310.2 of this title.

(10) An analysis and explanation of why neither a right-of-way under section 507 of the act (43 U.S.C. 1767), nor a cooperative agreement under sections 302(b) (43 U.S.C. 1732(b)) and 307(b) (43 U.S.C. 1737(b)) of the act would adequately provide for the proposed use.

(11) The duration of the withdrawal, with a statement in justification thereof (see § 2310.3-4 of this title). Where an extension of an existing withdrawal is requested, its duration may not exceed the duration of the existing withdrawal.

(12) A statement as to whether any suitable alternative sites are available for the proposed use or for uses which the requested withdrawal action would displace. The statement shall include a study comparing the projected costs of obtaining each alternative site in suitable condition for the intended use, as well as the projected costs of obtaining and developing each alternative site for uses that the requested withdrawal action would displace.

(13) A statement as to whether water will or will not be needed to fulfill the purpose of the requested withdrawal action.

(14) The place where records relating to the application can be examined by interested persons.

(d) Except in the case of an emergency withdrawal, if the preceding application requirements have not been met, or if an application seeks an action that is not within the scope of the Secretary's authority, the application may be rejected by the authorized officer as a defective application.

#### § 2310.1-3 Submission of withdrawal petitions.

(a) Withdrawal petitions shall be submitted to the Director, Bureau of Land Management, for transmittal to the Secretary.

(b) No specific form is required, but the petition shall contain at least the following information:

(1) The office originating the petition;

(2) The type and purpose of the proposed withdrawal action (See § 2300.0-5(h) of this title) and whether the petition pertains to the making, extension or modification of a withdrawal;

(3) A legal description of the entire land area that falls within the exterior boundaries affected by the petition, together with the total acreage of such lands, and a map of the area;

(4) The extent to which and the time during which any public lands that may be involved in the petition would be temporarily segregated and the temporary land uses that may be permitted during the segregation period, in accordance with § 2310.2 of this title; and

(5) A preliminary identification of the mineral resources in the area.

(c) Except in the case of petitions seeking emergency withdrawals, if a petition is submitted simultaneously with a withdrawal application, the information requirements pertaining to withdrawal applications (See § 2310.1-2 of this title), shall supersede the requirements of this section.

(d) If a petition seeks an emergency withdrawal under the provisions of section 204(e) of the act, the petition shall be filed simultaneously with an application for withdrawal. In such instances, the petition/application shall provide as much of the information required by §§ 2310.1-2(c) and 2310.3-2(b) of this title as is available to the petitioner when the petition is submitted.

(e) Upon the approval by the Secretary of a petition for withdrawal, the petition shall be considered as a Secretarial proposal for withdrawal, and notice of the withdrawal proposal shall be published immediately in the Federal Register in accordance with § 2310.3-1(a) of this title. If a petition which seeks an emergency withdrawal is approved by the Secretary, the publication and notice provisions pertaining to emergency withdrawals shall be applicable. (See § 2310.5 of this title.)

#### § 2310.1-4 Cancellation of withdrawal applications or withdrawal proposals and denial of applications.

(a) Withdrawal or extension applications and proposals shall be amended promptly to cancel the application or proposal, in whole or in part, with respect to any lands which the applicant, in the case of applications, or the office, in the case of proposals, determines are no longer needed in connection with a requested or proposed action. The filing of a cancellation notice in each such case shall result in the termination of the segregation of the public lands that are to be eliminated from the withdrawal application or withdrawal proposal. (See § 2310.2-1 of this title)

(b) The Secretary may deny an application if the costs (as defined in section 204(b) of the act (43 U.S.C. 1704(b)) estimated to be incurred by the Department of the Interior would, in the judgment of the Secretary, be excessive in relation to available funds appropriated for processing applications requesting a discretionary withdrawal, or a modification or extension of a withdrawal.

#### § 2310.2 Segregative effect of withdrawal applications or withdrawal proposals.

The following provisions apply only to applications or proposals to withdraw lands and not to applications or proposals seeking to modify or extend withdrawals.

(a) *Withdrawal applications or withdrawal proposals submitted on or after October 21, 1976.*—Within 30 days of the submission for filing of a withdrawal application, or whenever a withdrawal proposal is made, a notice stating that the application has been submitted or that the proposal has been made, shall be published in the Federal Register by the authorized officer. Publication of the notice in the Federal Register shall segregate the lands described in the application or proposal from settlement, sale, location or entry under the public land laws, including the mining laws, to the extent specified in the notice, for 2 years from the date of publication of the notice unless the segregative effect is terminated sooner in accordance with the provisions of this Part. The notices published pursuant to the provisions of this section shall be the same notices required by § 2310.3-1 of this title. Publication of a notice of a withdrawal application that is based on a prior withdrawal proposal, notice of which was published in the Federal Register, shall not operate to extend the segregation period which commenced upon the publication of the prior withdrawal proposal.

(b) *Withdrawal applications submitted before October 21, 1976.*—The public lands described in a withdrawal application filed before October 21, 1976, shall remain segregated through October 20, 1991, from settlement, sale, location or entry under the public land laws, including the mining laws, to the extent specified in the Federal Register notice or notices that pertain to the application, unless the segregative effect of the application is terminated sooner in accordance with other provisions of this Part. Any amendment made on or after October 21, 1976, of a withdrawal application submitted before October 21, 1976, for the purpose of adding Federal lands to the lands described in a previous application, shall require the publication in the Federal Register, within 30 days of receipt of the amended application, of a notice of the amendment of the withdrawal application. All of the lands described in the amended application which includes those lands described in the original application shall be segregated for 2 years from the date of publication of the notice of the amended application in the Federal Register.

(c) Applications for licenses, permits, cooperative agreements or other discretionary land use authorizations of a temporary nature that are filed on or after October 21, 1976, regarding lands involved in a withdrawal application or a withdrawal proposal and that are listed in the notices required by § 2310.3-2 of this title as permissible during the segregation period, may be approved by the authorized officer while the lands remain segregated.

of this section, applications for the use of lands involved in a withdrawal application or a withdrawal proposal, the allowance of which is discretionary, shall be denied.

(c) The temporary segregation of lands in connection with a withdrawal application or a withdrawal proposal shall not effect in any respect Federal or other administrative jurisdiction of the lands, and the segregation shall not have the effect of authorizing or permitting any use of the lands by the applicant or using agency.

**§ 2310.2-1 Termination of the segregative effect of withdrawal applications or withdrawal proposals.**

(a) The publication in the Federal Register of an order allowing a withdrawal application, in whole or in part, shall terminate the segregative effect of the application as to those lands withdrawn by the order.

(b) The denial of a withdrawal application, in whole or in part, shall result in the termination of the segregative effect of the application or proposal as to those lands where the withdrawal is disallowed. Within 30 days following the decision to disallow the application or proposal, in whole or in part, the authorized officer shall publish a notice in the Federal Register specifying the reasons for the denial and the date that the segregative period terminated. The termination date of the segregation period shall be noted promptly on the public land status records on or before the termination date.

(c) The cancellation, in whole or in part, of a withdrawal application or a withdrawal proposal shall result in the termination of the segregative effect of the application or proposal, as to those lands deleted from the application or proposal. The authorized officer shall publish a notice in the Federal Register, within 30 days following the date of receipt of the cancellation, specifying the date that the segregation terminated. The termination date of the segregation shall be noted promptly on the public land status records. If the cancellation applies to only a portion of the public lands that are described in the withdrawal application or withdrawal proposal, then the lands that are not affected by the cancellation shall remain segregated.

(d) The segregative effect resulting from the publication on or after October 1, 1976, of a Federal Register notice of the submission of a withdrawal application or the making of a withdrawal proposal shall terminate 2 years after the publication date of the Federal Register notice unless the segregation is terminated sooner by other provisions of this section. A notice specifying the date and time of termination shall be published in the Federal Register by the authorized

officer 30 days in advance of the termination date. The public land status records shall be noted as to the termination date of the segregation period on or before the termination date.

Such a termination shall not affect the processing of the withdrawal application.

(e) The segregative effect resulting from the submission of a withdrawal application or withdrawal proposal before October 21, 1976, shall terminate on October 20, 1991, unless the segregation is terminated sooner by other provisions of this part. A notice specifying the date and time of termination shall be published in the Federal Register by the authorized officer 30 days in advance of October 20, 1991. The public land status records shall be noted as to the termination date of the segregation period on or before October 20, 1991.

**§ 2310.3 Action on withdrawal applications and withdrawal proposals, except for emergency withdrawals.**

**§ 2310.3-1 Publication and public meeting requirements.**

(a) When a withdrawal proposal is made, a notice to that effect shall be published immediately in the Federal Register. The notice shall contain the information required by § 2310.1-3 of this title. In the event a withdrawal petition, which subsequently becomes a withdrawal proposal, is submitted simultaneously with a withdrawal application, the information requirements for notices pertaining to withdrawal applications (See paragraph (b) of this section) shall supersede the information requirements of this paragraph. However, in such instances, the notice required by paragraph (b) of this section shall be published immediately without regard to the 30-day period allowed for the filing for publication in the Federal Register of withdrawal application notices.

(b)(1) Except for emergency withdrawals and except as otherwise provided in paragraph (a) of this section, within 30 days of the submission for filing of a withdrawal, extension or modification application, the authorized officer shall publish in the Federal Register a notice to that effect. The authorized officer also shall publish the same notice in at least one newspaper having a general circulation in the vicinity of the lands involved and, with the cooperation and assistance of the applicant, when appropriate, shall provide sufficient publicity to inform the interested public of the requested action.

(2) The notice shall contain, in summary form, the information required by § 2310.1-2 of this title, except that the authorized officer may exclude the information required by § 2310.1-2(c)(2) of this title, and as much of the descriptive information required by

§ 2310.1-2(c) (3) and (6) of this title as the authorized officer considers appropriate. The notice shall:

(i) Provide a legal description of the lands affected by the application, together with the total acreage of such lands;

(ii) Specify the extent to which and the time during which any lands that may be involved may be segregated in accordance with § 2310.2 of this title;

(iii) Identify the temporary land uses that may be permitted or allowed during the segregation period as provided for in § 2310.2(c) of this title;

(iv) Provide for a suitable period of at least 90 days after publication of the notice, for public comment on the requested action;

(v) Solicit written comments from the public as to the requested action and provide for one or more public meetings in relation to requested actions involving 5,000 or more acres in the aggregate and, as to requested actions involving less than 5,000 acres, solicit and evaluate the written comments of the public as to the requested action and as to the need for public meetings;

(vi) State, in the case of a national defense withdrawal which can only be made by an act of Congress, that if the withdrawal is to be made, it will be made by an act of Congress;

(vii) Provide the address of the Bureau of Land Management office in which the application and the case file pertaining to it are available for public inspection and to which the written comments of the public should be sent;

(viii) State that the application will be processed in accordance with the regulations set forth in Part 2300 of this title;

(ix) Reference, if appropriate, the Federal Register in which the notice of a withdrawal proposal, if any, pertaining to the application was published previously;

(x) Provide such additional information as the authorized officer deems necessary or appropriate.

(c)(1) In determining whether a public meeting will be held on applications involving less than 5,000 acres of land, the authorized officer shall consider whether or not:

(i) A large number of persons have expressed objections to or suggestions regarding the requested action;

(ii) The objections or suggestions expressed appear to have merit without regard to the number of persons responding;

(iii) A public meeting can effectively develop information which would otherwise be difficult or costly to accumulate;

(iv) The requested action, because of the amount of acreage involved, the location of the affected lands or other relevant factors, would have an important effect on the public, as for example, the national or regional economy;

(v) There is an appreciable public interest in the lands or their use, as indicated by the records of the Bureau of Land Management;

(vi) There is prevailing public opinion in the area that favors public meetings or shows particular concern over withdrawal actions; and

(vii) The applicant has requested a public meeting.

(2) A public meeting, whether required or determined by the authorized officer to be necessary, shall be held at a time and place convenient to the interested public, the applicant and the authorized officer. A notice stating the time and place of the meeting, shall be published in the Federal Register and in at least one newspaper having a general circulation in the vicinity of lands involved in the requested action, at least 30 days before the scheduled date of the meeting.

**§ 2310.3-2 Development and processing of the case file for submission to the Secretary.**

(a) Except as otherwise provided in § 2310.3-6(b) of this title, the information, studies, analyses and reports identified in this paragraph that are required by applicable statutes, or which the authorized officer determines to be required for the Secretary or the Congress to make a decision or recommendation on a requested withdrawal, shall be provided by the applicant. The authorized officer shall assist the applicant to the extent the authorized officer considers it necessary or appropriate to do so. The qualifications of all specialists utilized by either the authorized officer or the applicant to prepare the information, studies, analyses and reports shall be provided.

(b) The information, studies, analyses and reports which, as appropriate, shall be provided by the applicant shall include:

(1) A report identifying the present users of the lands involved, explaining how the users will be affected by the proposed use and analyzing the manner in which existing and potential resource uses are incompatible with or conflict with the proposed use of the lands and resources that would be affected by the requested action. The report shall also specify the provisions that are to be made for, and an economic analysis of, the continuation, alteration or

termination of existing uses. If the provisions of § 2310.3-5 of this title are applicable to the proposed withdrawal, the applicant shall also furnish a certification that the requirements of that section shall be satisfied promptly if the withdrawal is allowed or authorized.

(2) If the application states that the use of water in any State will be necessary to fulfill the purposes of the requested withdrawal, extension or modification, a report specifying that the applicant or using agency has acquired, or proposes to acquire, rights to the use of the water in conformity with applicable State laws and procedures relating to the control, appropriation, use and distribution of water, or whether the withdrawal is intended to reserve, pursuant to Federal law, sufficient unappropriated water to fulfill the purposes of the withdrawal. Water shall be reserved pursuant to Federal law for use in carrying out the purposes of the withdrawal only if specifically so stated in the relevant withdrawal order, as provided in § 2310.3-3(b) of this title and only to the extent needed for the purpose or purposes of the withdrawal as expressed in the withdrawal order. The applicant shall also provide proof of notification of the involved State's department of water resources when a land use needed to carry out the purposes of the requested withdrawal will involve utilization of the water resources in a State. As a condition to the allowance of an order reserving water, the applicant shall certify to the Secretary that it shall quantify the amount of water to be reserved by the order.

(3) An environmental assessment, an environmental impact statement or any other documents as are needed to meet the requirements of the National Environmental Policy Act of 1969 (42 U.S.C. 4332(2)(C)), and the regulations applicable thereto. The authorized officer shall participate in the development of environmental assessments or impact statements. The applicant shall designate the Bureau of Land Management as a cooperating agency and shall comply with the requirements of the regulations of the Council on Environmental Quality. The Bureau of Land Management shall, at a minimum, independently evaluate and review the final product. The following items shall either be included in the assessment or impact statement, or they may be submitted separately, with appropriate cross references.

(i) A report on the identification of cultural resources prepared in accordance with the requirements of 36

CFR Part 800, and other applicable regulations.

(ii) An identification of the roadless areas or roadless islands having wilderness characteristics, as described in the Wilderness Act of 1964 (16 U.S.C. 1131, et seq.), which exist within the area covered by the requested withdrawal action.

(iii) A mineral resource analysis prepared by a qualified mining engineer, engineering geologist or geologist which shall include, but shall not be limited to, information on: General geology, known mineral deposits, past and present mineral production, mining claims, mineral leases, evaluation of future mineral potential and present and potential market demands.

(iv) A biological assessment of any listed or proposed endangered or threatened species, and their critical habitat, which may occur on or in the vicinity of the involved lands, prepared in accordance with the provisions of section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1536), and regulations applicable thereto, if the Secretary determines that assessment is required by law.

(v) An analysis of the economic impact of the proposed uses and changes in use associated with the requested action on individuals, local communities, State and local government interests, the regional economy and the Nation as a whole.

(vi) A statement as to the extent and manner in which the public participated in the environmental review process.

(4) A statement with specific supporting data, as to:

(i) Whether the lands involved are floodplains or are considered wetlands; and

(ii) Whether the existing and proposed uses would affect or be affected by such floodplains or wetlands and, if so, to what degree and in what manner. The statement shall indicate whether, if the requested action is allowed, it will comply with the provisions of Executive Orders 11988 and 11990 of May 24, 1977 (42 FR 26951; 26981).

(5) A statement of the consultation which has been or will be conducted with other Federal departments or agencies; with regional, State and local Government bodies; and with individuals and nongovernmental groups regarding the requested action.

(c) Prior to final action being taken in connection with an application, the applicant shall prepare, with the guidance and participation of the authorized officer, and subject to the approval of the authorized officer, the Secretary and other affected departments, agencies or offices, a

resource management plan and implementation program regarding the use and management of any public lands with their related resources uses. Consideration shall be given to the impact of the proposed reservation on access to and the use of the land areas that are located in the vicinity of the lands proposed to be withdrawn. Where appropriate, the plan and program will be implemented by means of a memorandum of understanding between the affected agencies. Any allocation of jurisdiction between the agencies shall be effected in the public land order or legislation. In those cases where the Secretary, acting through the Bureau of Land Management, would continue to exercise partial jurisdiction, resource management of withdrawn areas may be governed by the issuance of management decisions by the Bureau of Land Management to implement land use plans developed or revised under the land use planning requirements of section 202 of the act (43 U.S.C. 1712).

(d) In regard to national defense withdrawals that can only be made by an act of Congress, and to the extent that they are not otherwise satisfied by the information, studies, analyses and reports provided in accordance with the provisions of this section, the provisions of section 3(7) of the Act of February 28, 1958 (43 U.S.C. 157(7)), shall be complied with.

(e) The authorized officer shall develop preliminary findings and recommendations to be submitted to the Secretary, advise the applicant of the findings and recommendations, and provide the applicant an opportunity to discuss any objections thereto which the applicant may have.

(f) Following the discussion process, or in the absence thereof, the authorized officer shall prepare the findings, keyed specifically to the relevant portions of the case file, and the recommendations to the Secretary in connection with the application. The authorized officer also shall prepare, for consideration by the Secretary, a proposed order or notice of denial. In the case of a national defense withdrawal which can only be made by an act of Congress, the authorized officer shall prepare, with the cooperation of the applicant, a draft legislative proposal to implement the applicant's withdrawal request, together with proposed recommendations for submission by the Secretary to the Congress. The findings and recommendations of the authorized officer, and the other documents previously specified in this section to be prepared by the authorized officer shall be made a part of the case file. The case

file shall then be sent to the Director, Bureau of Land Management. At the same time, a copy of the findings and recommendations of the authorized officer shall be sent to the applicant.

(1) If the applicant objects to the authorized officer's findings and recommendations to the Secretary, the applicant may, within 30 days of the receipt by the applicant of notification thereof, state its objections in writing and request the Director to review the authorized officer's findings and recommendations. The applicant shall be advised of the Director's decision within 30 days of receipt of the applicant's statement of objections in the Bureau of Land Management's Washington office. The applicant's statement of objections and the Director's decision shall be made a part of the case file and thereafter the case file shall be submitted to the Secretary.

(2) If the applicant disagrees with the decision of the Director, Bureau of Land Management, the applicant may, within 30 days of receipt by the applicant of the Director's decision, submit to the Secretary a statement of reasons for disagreement. The statement shall be considered by the Secretary together with the findings and recommendations of the authorized officer, the applicant's statement of objections, the decision of the Director, the balance of the case file and such additional information as the Secretary may request.

#### **§ 2310.3-3 Action by the Secretary—public land orders and notices of denial.**

(a) Except for national defense withdrawals which can only be made by an act of Congress, and except as may be otherwise provided in section 1(d) of Executive Order 10355 (17 FR 4833), for applications that are subject to that order, the allowance or denial, in whole or in part, of a withdrawal, modification or extension application, may only be made by the Secretary.

(b)(1) Before the allowance of an application, in whole or in part, the Secretary shall first approve all applicable memoranda of understanding and the applicant shall make all certifications required in this part. When an application has been finally allowed, in whole or in part, by the Secretary, an order to that effect shall be published promptly in the Federal Register. Each order shall be designated as, and shall be signed by the Secretary and issued in the form of, a "public land order." Water shall be reserved pursuant to Federal law for use in carrying out the purposes of the withdrawal only if specifically so stated in the relevant public land order. In appropriate cases, the public land order also shall refer to the

memorandum of understanding discussed in § 2310.3-2(c) of this title and shall be drawn to comply with § 2310.3-6 of this title.

(2) On the same day an order withdrawing 5,000 or more acres in the aggregate is signed, the Secretary shall advise, in writing, each House of the Congress, or in the case of an emergency withdrawal, the appropriate Committee of each House, of the withdrawal action taken. Pursuant to the Secretary's authority under the act, the notices that are sent to the Congress shall be accompanied by the information required by section 204(c)(2) of the act (43 U.S.C. 1714(c)(2)), except in the case of an emergency withdrawal, transmittal of the required information may be delayed as provided in § 2310.5(c) of this title.

(c) When the action sought in an application involves the exercise by the Secretary of authority delegated by Executive Order 10355 (17 FR 4831) and the Secretary denies the application in whole or in part, the applicant shall be notified of the reasons for the Secretary's decision. The decision shall be subject to further consideration only if the applicant informs the Secretary, in writing, within 15 days of the receipt by the applicant of the Secretary's decision, that the applicant has submitted the matter to the Office of Management and Budget for consideration and adjustment, as provided for in section 601 of the Executive Order.

(d) A withdrawal application shall be denied, if, in the opinion of the Secretary, the applicant is attempting to circumvent the Congressional review provisions of section 204(c)(1) of the act (43 U.S.C. 1714(c)(1)) concerning withdrawals of 5,000 or more acres in the aggregate.

(e) When an application is denied in its entirety by the Secretary, a notice to that effect, signed by the Secretary, shall be published promptly in the Federal Register.

(f) In the case of a national defense withdrawal that may only be made by an act of Congress, the Secretary shall transmit to the Congress proposed legislation effecting the withdrawal requested, together with the recommendations of the Secretary which may or may not support the proposed legislation in whole or in part. The proposed legislation shall contain such provisions for continued operation of the public land laws as to the public land areas included in the requested withdrawal as shall be determined by the Secretary to be compatible with the intended military use.

#### § 2310.3-4 Duration of withdrawals.

(a) An order initially withdrawing 5,000 or more acres of land in the aggregate, on the basis of the Secretary's authority under section 204 of the act (43 U.S.C. 1714), may be made for a period not to exceed 20 years from the date the order is signed, except that withdrawals exceeding 5,000 acres in the State of Alaska shall not become effective until notice is provided in the Federal Register and to both Houses of Congress. All orders withdrawing 5,000 or more acres in the aggregate shall be subject to the Congressional review provision of section 204(c) of the act (43 U.S.C. 1714(c)), except as follows:

(1) A National Wildlife Refuge System withdrawal may not be terminated as provided in section 204(c)(1) of the act (43 U.S.C. 1714(c)(1)) other than by an act of Congress; or

(2) A withdrawal exceeding 5,000 acres in the State of Alaska shall terminate unless Congress passes a Joint Resolution of approval within 1 year after the notice of such withdrawal has been submitted to the Congress.

(b) An order initially withdrawing less than 5,000 acres of land, in the aggregate, on the basis of the Secretary's authority under section 204 of the act (43 U.S.C. 1714), may be made:

(1) For such time as the Secretary determines desirable for a resource use;

(2) For not more than 20 years for any other use, including, but not limited to, the use of lands for non-resource uses, related administrative sites and facilities or for other proprietary purposes; or

(3) For not more than 5 years to preserve the lands for a specific use then under consideration by either House of Congress.

(c) An order withdrawing lands on the basis of an emergency as provided for in section 204(e) of the act (43 U.S.C. 1714(e)) may be made for not more than 3 years.

(d) Except for emergency withdrawals, withdrawals of specific duration may be extended, as provided for in § 2310.4 of this title.

#### § 2310.3-5 Compensation for improvements.

(a) When an application is allowed, the applicant shall compensate the holder of record of each permit, license or lease lawfully terminated or revoked after the allowance of an application, for all authorized improvements placed on the lands under the terms and conditions of the permit, license or lease, before the lands were segregated or withdrawn. The amount of such compensation shall be determined by an appraisal as of the date of revocation or

termination of the permit, license or lease, but shall not exceed fair market value. To the extent such improvements were constructed with Federal funds, they shall not be compensable unless the United States has been reimbursed for such funds prior to the allowance of the application and then only to the extent of the sum that the United States has received.

(b) When an application is allowed that affects public lands which are subject to permits or leases for the grazing of domestic livestock and that is required to be terminated, the applicant shall comply with the cancellation notice and compensation requirements of section 402(g) of the act (43 U.S.C. 1752(g)), to the extent applicable.

#### § 2310.3-6 Transfer of jurisdiction.

A public land order that reserves lands for a department, agency or office, shall specify the extent to which jurisdiction over the lands and their related resource uses will be exercised by that department, agency or office. (See § 2310.3-2(c) of this title).

#### § 2310.4 Review and extensions of withdrawals.

(a) Discretionary withdrawals of specific duration, whether made prior to or after October 21, 1976, shall be reviewed by the Secretary commencing at least 2 years before the expiration date of the withdrawal. When requested, the department, agency or office benefitting from the withdrawal shall promptly provide the Secretary with the information required by § 2310.1-2(c) of this title, and the information required by § 2310.3-2(b) of this title, in the form of a withdrawal extension application with supplemental information. If the concerned department, agency or office is delinquent in responding to such request, the delinquency shall constitute a ground for not extending the withdrawal. Such withdrawals may be extended or further extended only upon compliance with these regulations, and only if the Secretary determines that the purpose for which the withdrawal was first made requires the extension, and then only for a period that shall not exceed the duration of the original withdrawal period. In allowing an extension, the Secretary shall comply with the provisions of section 204(c) of the act (43 U.S.C. 1714(c)), or section 204(d) of the act (43 U.S.C. 1714(d)), whichever is applicable; and, whether or not an extension is allowed, the Secretary shall report promptly on the decision for each pending extension to the Congressional Committees that are

specified in section 204(f) of the act (43 U.S.C. 1714(f)).

(b) Notwithstanding the provisions of this section, if the Secretary determines that a National Wildlife Refuge System withdrawal of specific duration shall not be extended, the Secretary shall nevertheless extend or reextend the withdrawal until such time as the withdrawal is terminated by an act of Congress.

#### § 2310.5 Special action on emergency withdrawals.

(a) When the Secretary determines, or when either one of the two Committees of the Congress that are specified in section 204(e) of the act (43 U.S.C. 1714(e)) notifies the Secretary, that an emergency exists and that extraordinary measures need to be taken to protect natural resources or resource values that otherwise would be lost, the Secretary shall immediately make a withdrawal which shall be limited in its scope and duration to the emergency. An emergency withdrawal shall be effective when signed, shall not exceed 3 years in duration and may not be extended by the Secretary. If it is determined that the lands involved in an emergency withdrawal should continue to be withdrawn, a withdrawal application should be submitted to the Bureau of Land Management in keeping with the normal procedures for processing a withdrawal as provided for in this subpart. Such applications will be subject to the provisions of section 204(c) of the act (43 U.S.C. 1714(c)), or section 204(d) of the act (43 U.S.C. 1714(d)), whichever is applicable, as well as section 204(b)(1) of the act (43 U.S.C. 1714(b)(1)).

(b) When an emergency withdrawal is signed, the Secretary shall on the same day, send a notice of the withdrawal to the two Committees of the Congress that are specified for that purpose in section 204(e) of the act (43 U.S.C. 1714(e)).

(c) The Secretary shall forward a report to each of the aforementioned committees within 90 days after filing with them the notice of emergency withdrawal. Reports for all such withdrawals, regardless of the amount of acreage withdrawn, shall contain the information specified in section 204(c)(2) of the act (43 U.S.C. 1714(c)(2)).

#### Subpart 2320—Federal Energy Regulatory Commission Withdrawals

##### § 2320.0-3 Authority.

(a) Section 24 of the Federal Power Act of June 10, 1920, as amended (16 U.S.C. 818), provides that any lands of the United States included in an application for power development



under that Act shall, from the date of filing of an application therefor, be reserved from entry, location or other disposal under the laws of the United States until otherwise directed by the Federal Energy Regulatory Commission or by Congress. This statute also provides that whenever the Commission shall determine that the value of any lands of the United States withdrawn or classified for power purposes shall not be injured or destroyed for such purposes by location, entry or selection under the public land laws, the Secretary of the Interior shall declare such lands open to location, entry or selection for such purposes under such restrictions as the Commission may determine are necessary, and subject to and with a reservation of the right of the United States or its permittees or licensees to enter upon, occupy and use any and all of the lands for power purposes. Before any lands are declared open to location, entry or selection, the Secretary shall give notice of his intention to make this declaration to the Governor of the State within which such lands are located, and the State shall have a preference for a period of 90 days from the date of this notice to file under any applicable law or regulation an application of the State, or any political subdivision thereof, for any lands required as a right-of-way for a public highway or as a source of materials for the construction and maintenance of such highways. The 90-day preference does not apply to lands which remain withdrawn for national forest or other purposes.

(b) The Mining Claims Rights Restoration Act of 1955 (30 U.S.C. 621 et seq.), opened public lands which were then, or thereafter, withdrawn or classified for power purposes, with specified exceptions, to mineral location and development under certain circumstances.

**§ 2320.1 Lands considered withdrawn or classified for power purposes.**

The following classes of lands of the United States are considered as withdrawn or classified for the purposes of section 24 of the Federal Power Act (16 U.S.C. 818): Lands withdrawn for powersite reserves under sections 1 and 2 of the Act of June 25, 1910, as amended (43 U.S.C. 141-148); lands included in an application for power development under the Federal Power Act (16 U.S.C. 818); lands classified for powersite purposes under the Act of March 3, 1879 (43 U.S.C. 31); lands designated as valuable for power purposes under the Act of June 25, 1910, as amended (43 U.S.C. 148); the Act of June 9, 1916 (39 Stat. 218, 219), and the Act of February

26, 1919 (40 Stat. 1178, 1180); lands within final hydroelectric power permits under the Act of February 15, 1901 (43 U.S.C. 959); and lands within transmission line permits or approved rights-of-way under the aforementioned Act of February 15, 1901, or the Act of March 4, 1911 (43 U.S.C. 961).

**§ 2320.2 General determinations under the Federal Power Act.**

(a) On April 22, 1922, the Federal Power Commission (as predecessor to the Federal Energy Regulatory Commission) made a general determination "that where lands of the United States have heretofore been or hereafter may be reserved or classified as powersites, such reservation or classification being made solely because such lands are either occupied by power transmission lines or their occupancy and use for such purposes have been applied for or authorized under appropriate laws of the United States, and such lands have otherwise no value for power purposes, and are not occupied in trespass, the Commission determines that the value of such lands so reserved or classified or so applied for or authorized, shall not be injured or destroyed for the purposes of power development by location, entry or selection under the public land laws, subject to the reservation of section 24 of the Federal Power Act."

(b) The regulations governing mining locations on lands withdrawn or classified for power purposes, including lands that have been restored and opened to mining locations under section 24 of the Federal Power Act, are contained in Subpart 3730 and in Group 3800 of this title.

**§ 2320.3 Applications for restoration.**

(a) Other than with respect to national forest lands, applications for restoration and opening of lands withdrawn or classified for power purposes under the provisions of section 24 of the Federal Power Act shall be filed, in duplicate, in the proper office of the Bureau of Land Management as set forth in § 2321.2-1 of this title. No particular form of application is required, but it shall be typewritten or in legible handwriting, and it shall contain the information required by 18 CFR 25.1. Each application shall be accompanied by a service charge of \$10 which is not returnable.

(b) Favorable action upon an application for restoration shall not give the applicant any preference right when the lands are opened.

**PARTS 2310, 2320, 2340, AND 2350—[REMOVED]**

2. The following parts are removed as indicated:

- (a) Part 2310—removed in its entirety.
- (b) Part 2320—removed in its entirety.
- (c) Part 2340—removed in its entirety.
- (d) Part 2350—removed in its entirety.

**PART 2090—SPECIAL LAWS AND RULES**

**§§ 2091.4 and 2091.2-5 [Removed]**

3. Sections 201.2-4 and 2091.2-5 are removed from Subpart 2091.

Guy R. Martin,  
*Assistant Secretary of the Interior.*  
January 14, 1961.

(PR Doc. 61-1009 Filed 1-16-61; 8:43 am)





## Department of Energy

Bonneville Power Administration  
P.O. Box 3621  
Portland, Oregon 97208

In reply refer to: PJ

DEC 10 1984

To Interested Parties:

Subject: Development of the Bonneville Power Administration (BPA) FY 1987 fish and wildlife budget.

Public Affected: Fish and wildlife agencies, Indian tribes, Federal and non-Federal electric power project owners and operators, BPA customers, and Pacific Northwest electric power ratepayers.

Opportunity for Comment: BPA would like your views on the preliminary FY 1987 fish and wildlife program proposal. All comments should be received by BPA by 5 p.m., January 7, 1985. Send them to Mr. John Palensky, Director, Division of Fish and Wildlife - PJ, BPA, P.O. Box 3621, Portland, OR 97208.

Background: The Pacific Northwest Power Act directs BPA to use the BPA fund to protect, mitigate, and enhance fish and wildlife affected by hydroelectric facilities in the Columbia River Basin. BPA carries out this responsibility primarily by providing funds for approximately one half of the measures contained in the Columbia River Basin Fish and Wildlife Program (Program) adopted by the Northwest Power Planning Council. Other agencies are responsible for the remaining measures.

BPA's status as a power marketing agency of the U.S. Department of Energy (DOE) dictates the process for the development of BPA's budget. In early February 1985, BPA program offices will submit FY 1987 program proposals. The Office of Power and Resources Management, which administers BPA's fish and wildlife funding, will submit a program proposal for fish and wildlife. BPA's executive management will review the proposals submitted, and the proposals will be assembled into a proposed agency-wide budget. BPA will submit this proposed budget to DOE for review in June 1985, and to the Office of Management and Budget for review in September 1985. BPA's budget will be submitted to Congress in January 1986 as part of the President's budget. Congress can be expected to act on BPA's FY 1987 budget by mid-summer 1986. FY 1987 begins October 1, 1986, and extends through September 30, 1987.

Enclosed for your review is a preliminary version of the Office of Power and Resources Management's FY 1987 program proposal for fish and wildlife, organized into categories corresponding to the Action Plan added to the Program by amendment in October 1984. The dollar amounts and narrative in the enclosure represent the preliminary views of BPA's Office of Power and Resources Management. As such, they are tentative and subject to change prior

to the submittal of the program proposal in February 1985 and during the remainder of the budget-development process described above. They were prepared to serve as a basis for public comment, and have not yet been reviewed or adopted by BPA.

In addition to the expenditures included in the program proposal for fish and wildlife, BPA's total budget includes other fish and wildlife costs. BPA revenues repay to the U.S. Treasury, with interest, the portion of the Government's capital investment in Federal Columbia River Power System fish facilities allocated to electric power generation. This investment totals more than \$410 million. BPA revenues also pay the annual operation and maintenance costs associated with this investment, totalling more than \$11 million per year. These costs are contained elsewhere in BPA's budgets. Moreover, although not reflected in BPA's budgets, the rate impact of implementing the Water Budget, as called for in the Program, is an estimated \$58 million in an average water year.

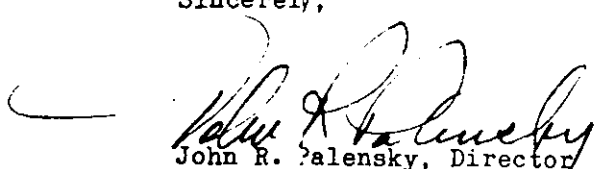
Your comments will be considered in formulating the final Office of Power and Resources Management FY 1987 program proposal for fish and wildlife, and in BPA's review of the program proposal. Early in 1986 BPA will mail to all commenters a summary of the comments received, and will notify commenters of modifications to the program proposal prior to the submittal of BPA's proposed budget to DOE in June 1986.

We would also appreciate your comments on this mailing. This is the first time BPA has solicited early-stage public comment in this fashion in the development of the annual fish and wildlife budget. Your comments will help us improve future public involvement procedures.

In addition, we are taking this opportunity to provide you two other items. The first is a letter recently sent to BPA's customers addressing major fish and wildlife capital improvements under consideration for funding in FY 1986. The second is a table containing fish and wildlife expenditures in the Pacific Northwest by Federal agencies, State fish and wildlife agencies, Indian tribes, and electric power utilities. BPA prepared this table earlier this year in response to a congressional inquiry, and Administrator Peter Johnson asked that it be distributed to parties interested in Pacific Northwest fish and wildlife issues.

For Further Information Contact: The BPA Area or District Manager in your locality, or the Public Involvement office in Portland. The telephone number for the Public Involvement office in Portland is 503-230-3478. Toll-free lines: 800-452-8429 for Oregon outside of Portland; 800-547-6048 for Washington, Idaho, Montana, Utah, Nevada, Wyoming, and California. You may also contact the Division of Fish and Wildlife in Portland at 503-230-4981.

Sincerely,

  
John R. Palensky, Director  
Division of Fish and Wildlife



Department of Energy  
Bonneville Power Administration  
P.O. Box 3621  
Portland, Oregon 97208

OFFICE OF THE ADMINISTRATOR

DEC 11 1984

In reply refer to: BPA-DL

To Customers of the Bonneville Power Administration

Dear Customer:

The Bonneville Power Administration (BPA) is required, by law, to inform its customers of certain proposed major transmission additions before they are proposed to Congress. This letter identifies those items proposed for inclusion in the Fiscal Year (FY) 1986 budget presentation to the Congress.

BPA also wishes to inform its customers of significant new major capital construction projects contained in our proposed FY 1986 budget under the fish and wildlife provisions of the Pacific Northwest Power Act. (A major capital project is defined as one costing at least \$1,000,000 with an estimated life greater than 15 years.)

#### MAJOR TRANSMISSION SYSTEM ADDITIONS:

Section 5(b) of the Federal Columbia River Transmission System Act (October 18, 1974) provides that construction of any major transmission facility requires prior congressional approval. The term "major transmission facilities" means "transmission facilities intended to be used to provide services not previously provided by the Bonneville Power Administration with its own facilities."

There are no major transmission facility new starts in FY 1986.

#### MAJOR FISH AND WILDLIFE PROJECTS

##### White River Falls

The White River Falls fish passage project is identified as a project in the Columbia River Basin Fish & Wildlife Program and is included in BPA's FY 1986 budget. Fish passage on the White River (a tributary of the Deschutes River) is now impeded by three natural waterfalls with a total combined height of 140 feet just upstream from the White River's confluence with the Deschutes River. In 1983 BPA funded studies which demonstrated the feasibility of opening over 120 stream miles of the river to anadromous fish, making the White River Basin potentially one of the largest new salmon and steelhead production areas in the entire Columbia River Basin. Various alternatives are now under consideration for providing fish passage by these waterfalls.

## John Day Acclimation Facilities

The Northwest Power Planning Council (Council) also called for the construction of the John Day Acclimation Facilities in the original Columbia River Basin Fish and Wildlife Program (Program) that was adopted in November 1982. BPA included funding for this project in its proposed FY 1986 budget anticipating that it would be a major capital new start. BPA is now reevaluating the schedule for the start of construction, the project's costs, and the size and scope of the project for consistency with the amendments to the Program adopted by the Council in October 1984.

## Other Projects

The Northwest Power Planning Council amended the Columbia River Basin Fish and Wildlife Program on October 10, 1984. BPA is now evaluating the amendments and associated budgetary requirements and as a result, may initiate other major fish and wildlife capital improvements in FY 1986 that are not presently in BPA's FY 1986 budget. Before these projects are proposed for inclusion in BPA's budget, they must be approved by the Administrator, the Department of Energy, and the Office of Management and Budget.

The following projects are candidates for initiation in FY 1986. With the exception of the low capital propagation facilities on the Nez Perce Indian Reservation, all projects are located in the State of Washington. References are to measures in the amended Columbia River Basin Fish and Wildlife Program.

- Artificial propagation facilities to produce juvenile anadromous fish for outplanting in the Yakima River Basin and elsewhere in the Columbia River Basin (measure 704(i)(3)).
- A trout hatchery on the Colville Indian Reservation (measure 804(e)(15)).
- "Low capital" anadromous fish propagation facilities on the Nez Perce Indian Reservation in Idaho (measure 704(j)(2)).
- Fish passage improvements at Enloe Dam on the Similkameen River (measure 704(d)(1), Table 5).
- Fish passage improvements at Tumwater Dam on the Wenatchee River (measure 704(d)(1), Table 5).
- Fish passage improvements at Dryden Dam on the Wenatchee River (measure 704(d)(1), Table 5).

If you have any comments on the two projects currently included in the FY 1986 budget proposal or the other projects that may be proposed, we will be happy to receive them. Please send any comments, in writing, by December 21, 1984, to our appropriate Area Manager, listed below:

Upper Columbia Area

Wayne Lee  
Room 561, U.S. Court House  
West 920 Riverside Avenue  
Spokane, Washington 99201

SNAKE RIVER AREA

Thomas V. Wagenhoffer  
P.O. Box 1518  
Walla Walla, Washington 99362

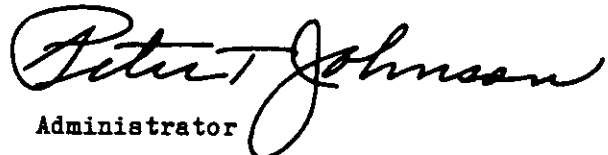
Lower Columbia Area

George E. Gwinnutt  
P.O. Box 3621  
Portland, Oregon 97208

Puget Sound Area

Richard D. Casad  
415 First Avenue North  
Room 250  
Seattle, Washington 98109

Sincerely,

  
Administrator

PRELIMINARY FISCAL YEAR 1987 FISH AND WILDLIFE PROGRAM PROPOSAL  
Office of Power and Resources Management  
Bonneville Power Administration

Amount (\$000)	Description 1/
10,620	<p>OTHER HABITAT AND PASSAGE RESTORATION</p> <p>Action Plan Item: 34.5                      Program Measure: 704(d)</p> <p>Program Measure 704(d) calls for passage and habitat improvements throughout the Columbia Basin. This amount includes a major passage improvement at Enloe Dam due to be in its construction phase in FY 1987, as well as passage and habitat improvements at many other locations. It also includes evaluations of BPA-funded habitat and passage improvements.</p>
9,700	<p>ARTIFICIAL PRODUCTION</p> <p>Action Plan Items: 34.11-34.18                      Program Measures: 704(i) and 704(j)</p> <p>Program Measures 704(i) and (j) call for BPA to fund salmon and steelhead production facilities. FY 1987 funding includes low capital production facilities on the Nez Perce reservation, the first year of construction of a Yakima Basin hatchery, and the second year of construction of a steelhead hatchery in the Umatilla Basin, among other projects.</p>
3,340	<p>IMPROVED HATCHERY EFFECTIVENESS</p> <p>Action Plan Item: 34.23                      Program Measure: 704(h)(2)</p> <p>Program Measure 704(h)(2) calls for BPA funding to examine hatchery practices, rearing and release strategies, maintenance of genetic integrity, fish health protection, and measuring smolt quality and readiness to migrate. This amount includes funding to address this measure.</p>
700	<p>STOCK SUPPLEMENTATION AND HATCHERY REPROGRAMMING</p> <p>Action Plan Items: 34.24-34.28                      Program Measures: 704(g) and 704(k)</p> <p>Includes funding for the evaluation of stock supplementation potential in the Willamette Basin and elsewhere, and support for hatchery reprogramming studies.</p>

DEC 20 1984



# Colville Confederated Tribes

P.O. Box 150 - Nespelem, Washington, 99155 (509) 634-4711

December 17, 1984

Larry Everson  
Bonneville Power Administration  
P.O. Box 3621  
Portland, OR 97208


Dear Mr. Everson:

It is the understanding of the Colville Confederated Tribes that several inter-agency meetings concerning development of hydropower on the Smilikameen River in Okanogan County, Washington, have been held, or will be held in the near future. The Colville Confederated Tribes would like to participate in any such meetings and would like to receive copies of any documents relating to the development of hydroelectric power on the Smilikameen River.

The Colville Confederated Tribes has opposed and continues to oppose the development of Enloe Dam on the Smilikameen River for hydroelectric purposes. The Tribes also opposes the replacement of Enloe Dam by a different and larger hydroelectric facility. The Tribes believe that the alternative of preference is removal of Enloe Dam. This action is necessary to both preserve existing runs of salmon and other fish on the Smilikameen River, and to allow for effective rehabilitation and utilization of that river for fishery purposes.

The Tribes look forward to working with the Bonneville Power Administration as it considers development on the Smilikameen River. The Tribes is always prepared to discuss new information, or data which may lead it to a different conclusion on how to proceed on the Smilikameen River. To this end the Tribes look forward to participating with you and your agency in other meetings regarding this matter.

Sincerely,

  
Al Aubertin, Chairman  
Colville Business Council

cc:  
Subject, Chrono  
ACC/gb



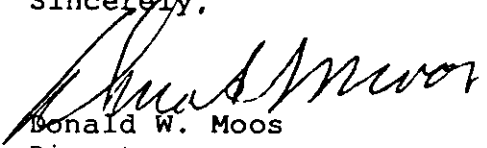


Mr. John Palensky  
December 21, 1984  
Page 2

3. WDOE supports fish passage improvements at Tumwater Dam on the Wenatchee River. Such actions are consistent with the intent of the department's Wenatchee River Basin Instream Resources Protection Program (Ch. 173-545 WAC.)
4. WDOE also supports fish passage improvements at Dryden Dam on the Wenatchee River (see comment above.)

The WDOE also intends to submit comments on the proposed FY 1987 fish and wildlife budget in early January. If you have any comments or questions on the comments, please contact Mr. Jim Bucknell at (206) 459-6115. Thank you.

Sincerely,



Donald W. Moos  
Director

DWM: dmt



JAN 09 1985  
*Ex of 1-11-85*  
*638*

DEPARTMENT OF ECOLOGY

January 4, 1985

Mr. John Palensky, Director  
Division of Fish and Wildlife - PS  
Bonneville Power Administration  
P.O. Box 3621  
Portland, OR 97208

Dear Mr. Palensky:

The Washington State Department of Ecology (WDOE) appreciates the opportunity to review and comment on the Bonneville Power Administration's (BPA) preliminary FY 1987 Fish and Wildlife Program Proposal. We have the following comments:

- Action Plan Item 32.1 (Mainstem Passage) - The WDOE supports the continued research proposed to alleviate problems associated with juvenile fish passage.
- Action Plan Items 33.1 and 33.2 (Water Budget) - The WDOE supports continued funding and implementation of the Water Budget.
- Action Plan Items 34.1-34.3 (Yakima Basin Habitat and Passage Restoration) - The WDOE would support these items for Yakima Basin Habitat and Passage Restoration provided they can be designed to be operable under existing flow conditions and future enhanced flow regimes as provided through the State of Washington/U.S. Bureau of Reclamation's Yakima River Basin Water Enhancement Project.
- Action Plan 34.5 (Other Habitat and Passage Restoration) - WDOE does not feel that the establishment of a self-sustaining salmon run above Enloe Dam is feasible at the present time because of the poor survival rate for downstream migrants at the mainstem Columbia River dams. However, the department would support such an activity when, and if, downstream passage is improved to a level where such a run can become self-sustaining. However, note that WDOE does not feel that such an activity should preclude the restoration of hydroelectric power production at Enloe Dam.

WDOE supports fish passage improvements at both Tumwater and Dryden dams on the Wenatchee River as being consistent with the Wenatchee River Basin Instream Resources Protection Program (Ch. 173-545 WAC).

- Action Plan Items 34.11-34.18 (Artificial Production) - WDOE could support the implementation of measure 704(i)(3) related to a fish hatchery for the Yakima River Basin, provided that the development, operation, and maintenance of the facility is found to be feasible and an integral part of the State of Washington/U.S. Bureau of Reclamation's Yakima River Basin Water Enhancement Project.
- Action Plan Item 34.23 (Improved Hatchery Effectiveness) - The WDOE supports the measures for improved hatchery effectiveness.
- Action Plan Items 34.24-34.28 (Stock Supplementation and Hatchery Reprogramming) - No comments.
- Action Plan Item 35.6 (Future Hydroelectric Development) - The WDOE supports efforts to improve turbine intake screens and continues to support the cumulative effects study and the protected areas study.
- Action Plan Item 36.2 (Goals) - The WDOE supports funding for the Section 201 Fish and Wildlife Program Goals Study.
- Action Plan Item 38.1 (Harvest Controls) - No comment.
- Action Plan Item 39.1 (Other Research) - No comment.
- Action Plan Item 40.2 (Wildlife Mitigation Loss Statements and Plans) - No comment.
- Action Plan Item 40.5 (Wildlife Mitigation Project Implementation) - The WDOE supports this item.
- Action Plan Item 41.1 (Resident Fish--Montana Projects) - No comment.
- Action Plan Item 41.2 (Colville Hatchery) - The WDOE supports funding of the trout hatchery on the Colville Indian Reservation.
- Action Plan Item 41.3 (Sturgeon Projects) - No comment.
- Action Plan Item 41.4 (Lake Pend Oreille Hatchery) - No comment.
- Action Plan Item 41.5-41.7 (Other Resident Fish Projects) - No comment.
- Action Projects - No comment.

The only other comment is that it would have been easier for WDOE to evaluate BPA's proposal had copies of the final amended Fish and Wildlife Program been made available by the council as the draft amendment document does not include all references.

Mr. John Palensky  
January 4, 1985  
Page 3

If you have any comments or questions on our comments, please contact  
Mr. Jim Bucknell of my staff at (206) 459-6115. Thank you.

Sincerely,

A handwritten signature in cursive script, appearing to read "Donald W. Moos".

Donald W. Moos  
Director



Reviewed: JAN

IDAHO DEPARTMENT OF FISH AND GAME  
600 South Walnut • Box 25  
Boise • Idaho • 83707

January 7, 1985

Mr. John Palensky, Director  
Division of Fish and Wildlife PJ  
Bonneville Power Administration  
P.O. Box 3621  
Portland, OR 97208

Dear Mr. Palensky:

Idaho Fish and Game staff has reviewed your letter of December 10, 1984, regarding 1986 and 1987 Fish and Wildlife Program proposals.

The December 11, 1984, letter to BPA customers which was attached to your letter lists projects for initiation in FY 1986. We note that all of the projects which involve anadromous fish are located upstream from the confluence of the Snake and Columbia rivers. Fish produced by these programs will pass through the Zone 6 fishery area on the Columbia River and will be mixed with fish produced by already established Snake River programs during their migration.

Our fisheries concerns are in two areas; first that there needs to be some resolution of mixed stock harvest management problems in Zone 6 to avoid nullifying any gains in habitat in upriver areas, and second, that new fish restoration or enhancement should not support fisheries which vitiate ongoing programs. These two factors must be carefully weighed prior to making large investments in upriver areas.

We are especially interested in the "Low Capital" propagation facilities on the Nez Perce Indian Reservation in Idaho with regard to impacts on other fisheries and coordination with ongoing programs. To date, information on the species and stock of fish to be produced, release schedule and utilization of the production has not been clearly defined. Integration of this project into basin-wide management must be assured prior to construction.

The FY 1987 preliminary list also includes many important upriver projects which could produce large numbers of fish, particularly from large habitat areas which will be made accessible to spawning anadromous fish. Success of rebuilding or reintroduction programs in enhanced habitat depends on providing adequate spawning escapements. Again, harvest management and coordination with other programs is essential. Reintroduction of anadromous fish to the Similkameen River or rebuilding Yakima River runs will require the same sort of adjustments in downriver fisheries as Snake River rebuilding programs.

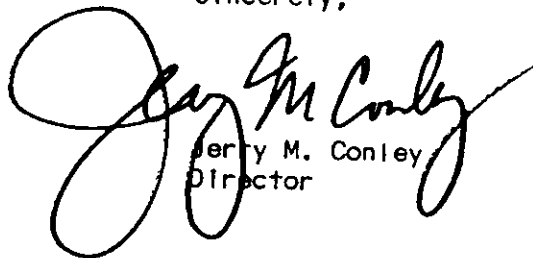
Mr. John Palensky  
January 7, 1985  
Page 2

All of the fisheries projects listed are, in our opinion, viable. Priority should remain with the mainstem passage and water budget projects because of their value to ongoing programs as well as future developments. As noted above, extra care must be taken in new enhancement programs to minimize conflicts with existing or planned activities.

With regards to wildlife, the FY 1987 proposed budget for wildlife mitigation project implementation (Action Item 40.5) appears to be considerably underfunded. The Montana Department of Fish, Wildlife, and Parks' wildlife mitigation plans give an indication of the funds needed to protect, mitigate, and enhance wildlife to the extent affected by hydroelectric projects. The FY 1987 proposed budget of 4.39 million dollars for implementation will be inadequate to mitigate "the wildlife impacts of several federal Columbia River power system dams." More funds will be needed, especially if plans from several states are submitted during the FY 1987 period, and if mitigation plans are written for projects without going through the impact statement process.

Thank you for the opportunity to review these proposals.

Sincerely,



Jerry M. Conley  
Director

# PNUCC

PACIFIC NORTHWEST UTILITIES CONFERENCE COMMITTEE

January 7, 1985

Reviewed:	JAN 09 1985
By:	KATY [Signature]
Copy:	John Palensky [Signature]
NO. 039	REPLY: [Signature]

Mr. John Palensky, Director  
Division of Fish and Wildlife-PJ  
Bonneville Power Administration  
P.O. Box 3621  
Portland, Oregon 97208

Dear John:

Attached are specific PNUCC comments for both your "Preliminary Fiscal Year 1987 Fish and Wildlife Program Proposal" and your December 11, 1984 letter on 1986 Capital Projects for Fish and Wildlife. Also, we have attached PNUCC's August 1984 comments to the Power Planning Council on their Program Amendments which cover many of the same items in your budget documents. In general, we are very concerned about the seemingly high level of research expenditures with very little justification and with the proposed expenditures for projects with no direct fishery benefits in the foreseeable future, such as Enloe Dam.

We appreciate the opportunity Bonneville Power Administration has provided to comment on your budget documents and encourage you to continue this procedure.

Very truly yours,

*Pam Barrow*

for Al Wright, Chairman  
PNUCC Fish and Wildlife Committee

AW:lp:157P

Attachments

## FY 87 PROGRAM PROPOSAL

### MAINSTEM PASSAGE

PNUCC comments to the Council are attached.

### WATER BUDGET

PNUCC believes that "related research" must include studies to determine the incremental benefits associated with the upper levels of the required Water Budget flows for both the Snake and Columbia Rivers. As we stated in our comments to the Power Planning Council in August 1984: "These upper increments of Water Budget flows are the levels that result in FELCC impacts of 500 to 600 MW. While it is generally concluded that some level of flow is necessary to provide the proper biological environment to enhance downstream migration, the precise level is yet to be determined. It may well be lower than the level presently assumed to be necessary and which results in high impacts on FELCC. We estimate that the annual Water Budget costs are at least \$60 million in secondary sales lost and could be as high as \$150 to \$200 million in subsequent years, depending on the decision to replace the lost FELCC. Therefore, it seems prudent to develop adequate data over the next five years to provide a cost-effective analysis for various increments of Water Budget flows and their associated biological benefits."

While Bonneville's Preliminary Program Proposal for FY87 does not specify what related research will be funded, Standard Report #14, September 20, 1984, lists research to be funded through FY89 but does not specifically identify any incremental survival studies. PNUCC strongly urges Bonneville to provide for such studies in its FY87 and later programs.

### YAKIMA BASIN

PNUCC comments to the Council are attached.

### OTHER HABITAT AND PASSAGE RESTORATION

Approximately one-half of these expenditures are attributable to passage improvement at Enloe Dam. PNUCC is opposed to spending millions of dollars at the upper end of the Columbia Basin when insufficient numbers of fish are now present, or will be present in the foreseeable future, that far upstream to provide much benefit from such improvements. Further, many of the problems surrounding Enloe remain unresolved. Within the next few decades BPA monies should be spent on priority fishery problems with expectations for reasonable results. Until there is agreement on the benefits of this project, agreement with the Canadians, and assurance that any passage improvement will not be inundated or altered in the future by proposed projects, budgeting of funds for Enloe passage is premature.

PNUCC also strongly encourages Bonneville to conduct verification procedures on existing habitat and passage improvement projects before initiation of large numbers of new habitat and passage improvement projects.



## ARTIFICIAL PRODUCTION

Capital expenditures should be itemized in this category, especially when many may exceed \$1 million. It is not clear where the bulk of the proposed \$9.7 million is to allocated.

## IMPROVED HATCHERY EFFECTIVENESS

PNUCC agrees with this Program measure and believes that these types of studies are necessary, however, \$3.34 million is far in excess of our expectations for such programs. In our comments to the Power Planning Council in August 1984, we recommended a cost-sharing between the state and federal agencies and Bonneville for research which benefits the fisheries agencies in their management of the resource. Research proposals under this action plan item should be carefully evaluated for cost-effective resolution of biological concerns and the appropriateness of the research to direct hydroelectric impacts.

## STOCK SUPPLEMENTATION AND HATCHERY REPROGRAMMING

PNUCC comments to the Council are attached.

## FUTURE HYDROELECTRIC DEVELOPMENT

The wording of this item is confusing. Does the amount indicated (\$650,000) represent funding only for the turbine intake screen study or does it also include cumulative impacts and protected areas? If cumulative impacts and protected areas will not be funded in FY87, why are they included in description of this item? \$650,000 represents a very large sum of money for the turbine intake screen study.

## GOALS

No comments. PNUCC will provide comments on goals to the Power Planning Council.

## HARVEST CONTROLS

PNUCC does not support the use of Bonneville funds for harvest control measures. We have attached our August 1984 comments to the Power Planning Council on this subject.

## OTHER RESEARCH

PNUCC is hopeful that BPA will conduct extensive evaluation of both FY1986 and FY1987 ongoing research even if a set of research objectives are not available from the Council.

## WILDLIFE MITIGATION LOSS STATEMENTS AND PLANS

PNUCC comments to the Council are attached.

## WILDLIFE MITIGATION PROJECT IMPLEMENTATION

PNUCC is concerned that this budgeted amount may reflect BPA purchase of lands which have been previously authorized by Congress to be purchased by another entity as mitigation for project development. For example, legislation was passed for Libby Dam which authorized the acquisition of 12,000 acres of land at a specific budgeted amount. Later, when this amount was appropriated, it was insufficient to cover the cost of the entire parcel of land. PNUCC believes that BPA funding for acquisition of the remainder (9,000 acres) of this parcel is inappropriate as an "in lieu of" expenditure (PNEPPCA Section 4(h)(10)(A)). It would only be appropriate for purchase of an amount of land in addition to the amount authorized by Congress.

## RESIDENT FISH--MONTANA PROJECTS

No comments.

## COLVILLE HATCHERY

PNUCC comments to the Council are attached.

## STURGEON PROJECTS

PNUCC does not agree with an expenditure of this magnitude for sturgeon research. In Standard Report #14, BPA has estimated that it will spend \$6.17 million on sturgeon research through FY89. We believe that this is an excessive amount to budget for sturgeon research, especially when the Council has yet to develop its plan for future research or give some indication of the relative emphasis it wants to place on sturgeon research activities. PNUCC has agreed with research to determine the impacts of hydroelectric development and operations on sturgeon, however, we never envisioned any programs requiring such massive levels of expenditures.

## LAKE PEND OREILLE HATCHERY

It is our understanding that this hatchery will be completed by FY86, even with unanticipated delays. Why have funds for this project been allocated for FY87?

#### OTHER RESIDENT FISH PROJECTS

Water purchase at Painted Rocks Reservoir is mitigation for the Lower Clark Fork resident fishery and as such is the responsibility of private hydroelectric projects. The costs of this mitigation should be borne by the private operators, not Bonneville. Funding by Bonneville is contrary to PNEPPCA Section 4(h)(10(A) prohibition against in lieu expenditures.

#### OTHER PROJECTS

Cabinet Gorge Hatchery is the same as the Lake Pend Oreille Hatchery. NEPA studies related to the construction of this hatchery were completed in November 1984. Why is funding for these studies budgeted for FY87? No additional funding should be required in FY87 as completion of these studies was necessary in order for construction to proceed.

## 1986 CAPITAL PROJECTS

### WHITE RIVER FALLS

PNUCC believes that spending for habitat improvement and passage restoration should be according to the following priorities:

1. activities which mitigate for direct hydroelectric impacts;
2. activities which put anadromous fish back into existing underseeded habitat;
3. activities which provide new habitat to anadromous fish or which provide "in lieu" mitigation for no direct hydroelectric impacts at non-hydroelectric problem areas.

PNUCC is concerned about funding for low priority items. The White River Falls project is considered a low priority item because it provides new habitat to anadromous fish and because it mitigates for no direct hydroelectric impact.

However, if there is consensus in the region that the biological data shows such large benefits to support initiation of the White River Falls project, PNUCC would agree with Bonneville funding only if the project is designed as a model "in lieu" mitigation system with provision for verification of expected benefits. At the same time, PNUCC expects that Bonneville will proceed more slowly toward initiation of many similar projects until the results of this "model" are available. We realize that there is substantial time delay in obtaining the verified result, however, we believe that evaluation of the success of individual "model" projects is crucial to overall Program success.

### JOHN DAY ACCLIMATION FACILITIES

PNUCC agrees that this project should be reevaluated. We have attached our August 1984 comments to the Council.

### OTHER PROJECTS

#### o Yakima Hatchery

It is not clear what activities are being considered for funding under this item. The Power Planning Council's Program requires funding of the development of a master plan for this facility prior to design of the facility. Any funding for this project at this time should be toward the development of the master plan.

#### o Colville Hatchery

PNUCC comments to the Council on this measure are attached.

#### o Nez Perce "low capital" facilities

PNUCC comments to the Council on this measure are attached.

#### o Enloe Dam

See comments on FY 87 Program Proposal under Other Habitat and Passage Restoration. PNUCC is totally opposed to expenditures at this project at this time.

JAN 07 1985

January 7, 1985

Mr. John Palensky  
Director, Division of Fish & Wildlife - PJ  
Bonneville Power Administration  
Post Office Box 3621  
Portland, Oregon 97208

RE: Development of the Bonneville Power Administration  
(BPA) FY 1987 Fish & Wildlife Program Budget

Dear Mr. Palensky:

The Public Power Council (PPC) appreciates the opportunity to submit the following comments regarding the "Notice of Development of the Bonneville Power Administration (BPA) FY 1987 Fish and Wildlife Budget" (Notice). PPC will continue to comment in all available forums on issues relating to BPA's Fish and Wildlife Program including budgeting, rate design and program costs, and program design. PPC's goal in participating in these forums is a cost-effective Fish and Wildlife Program.

PPC has submitted comments in three areas: first, on the inadequate detail provided in the notice; second, on the process used to determine a proposed project's feasibility; and third, on the funding level for sturgeon research.

PPC is concerned that the notice lacks sufficient detailed information or project costs to allow specific project comment. A more detailed breakdown of the dollars for specific project costs within a category is necessary before PPC can determine if the proposed budget levels are reasonable. For example, in the category "Habitat and Passage Restoration", the notice provides insufficient information to determine dollar amounts for proposed projects. In fact, the capital cost of the major passage improvement such as Enloe Dam cannot be distinguished from other restoration projects.

As a further example, the category "Improved Hatchery Effectiveness" proposes a significantly larger dollar amount than expected. The measure in the Council's Fish and Wildlife Program was much less involved than the measure now proposed in BPA's notice. It appears that BPA's budget is at least 50% higher than the program envisioned by the Council.

In addition, the notice does not clearly detail proposed research activities. The proposed 1987 Fish and Wildlife budget contains a number of measures that are research in nature. By our estimation \$7.5 million are related to research. This is an inordinate dollar expenditure given the program size. Research expenditures should be limited to approximately \$2 million.

The notice also fails to provide factual details on the projects proposed. By providing a short summary of the details of each proposed expenditure and capital project, BPA would allow the public to associate dollar figures with projected actions. Further, the short summary would allow the public to ask for additional details on specific projects of interest. Without sufficient detail, PPC is forced to conclude that proposed expenditures are larger than necessary and should be reduced.

Secondly, PPC remains concerned with the process BPA uses to determine the feasibility of the actual projects placed in the budget. For example, serious question remains over the feasibility of Enloe Dam. The relationship of the passage improvement project to proposed hydro electric projects in the basin remains unclear. In addition, the feasibility of the passage improvement remains in question given the opposition from some state agencies and Canada.

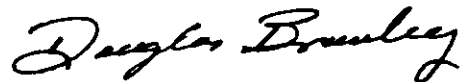
The remaining questions concerning the feasibility of the major capital expenditure on Enloe bring into issue the feasibility analysis for other proposed capital expenditure. Feasibility of each project must be clear or the region will be expending dollars which may not improve the fish and wildlife resource in the Columbia basin.

The proposed expenditures on the Yakima Basin hatchery are another example of a project with questionable feasibility. Expenditures for this project are at least premature. The construction of passage and habitat improvement will barely be completed by 1987. Prior to the expenditure of capital for a hatchery, the passage and habitat improvement should be completed and evaluated for effectiveness. In addition, the region is still struggling to define the goals of the Fish and Wildlife Program; until these goals are established hatchery construction should not be started.

Finally, PPC objects to the inclusion of \$1.48 million spent on sturgeon projects. This expenditure coupled with the dollars proposed in 1986 are entirely too much for an assessment and planning activity. It is not clear that this project in any way meets a goal of the region's fish and wildlife needs. Until these goals are met, it is inappropriate to spend this amount of money.

PPC objects to the processes used to determine budget levels and Fish and Wildlife Program. Although PPC appreciates this opportunity to comment on budget development, the notice fails to provide sufficient detailed information and project cost of each program measure. PPC feels the deficiencies in the notice must be corrected in order to allow the public a true opportunity to comment on the Fish and Wildlife Program's cost-effectiveness.

Sincerely,

A handwritten signature in cursive script that reads "Douglas R. Brawley".

Douglas R. Brawley  
Staff Engineer

DRB:sz  
SS:2:45

CHARLES COLLINS  
Chairman  
Washington  
  
Ken N. Lee  
Washington  
  
Keith L. Collins  
Montana  
  
Gerald Mueller  
Montana

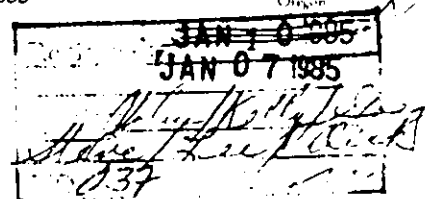
# NORTHWEST POWER PLANNING COUNCIL

SUITE 1100 • 850 S.W. BROADWAY  
PORTLAND, OREGON 97205 • (503) 222-5161

Toll free number for Idaho, Montana & Washington: 1-800-222-3355  
Toll free number for Oregon: 1-800-452-2324

Robert D. Smith  
Vice Chairman  
Idaho  
  
W. Gary Miller  
Idaho  
  
Ernest H. Hunsicker  
Oregon  
  
Donald W. Goslar  
Oregon

January 7, 1985



John Palensky, Director  
Division of Fish and Wildlife -- PJ  
Bonneville Power Administration  
P.O. Box 3621  
Portland, OR 97208

Dear John:

Thank you for the opportunity to comment on Bonneville's preliminary plans for fiscal year 1987 fish and wildlife expenditures. We are particularly pleased that Bonneville is seeking comments at this early stage of budget planning from the Indian tribes, fish and wildlife agencies, project owners and operators, and Bonneville customers and ratepayers, as well as the Council. We also were pleased that you used the action items in the Council's amended program to organize your spending plans. General comments on the proposal are set out below. More detailed comments on selected items are attached.

## GENERAL COMMENTS.

1. Future amendments. Under the current schedule in Chapter 11 of the Council's Power Plan, a program amendment process will begin in 1985, resulting in a revised program in 1986 which could affect the fiscal year 1987 program. The draft revision is likely to be released by July, 1986, so Bonneville will have an early indication of anticipated changes. The Council and Council staff have urged Bonneville in the past to include "automatic adjustment" clauses in its rate decisions and budget plans to accommodate program amendments. We continue to encourage you to do so.

2. Costs analysis. The Council contracted last fall with a consultant to review program costs and update the cost estimate now included in Program Section 105. That cost analysis should be available late this spring. We hope it will be useful to Bonneville, as well as the Indian tribes, fish and wildlife agencies, and Bonneville customers in developing and reviewing spending proposals designed to implement the Council's program.



All of these comments are preliminary. We look forward to future opportunities to review your budget proposals and to receipt of copies of comments submitted to Bonneville by other interested parties.

Sincerely,



Janis Chrisman  
Director, Fish and Wildlife Division

Attachment.

cc w/attachment: Columbia Basin tribes  
Columbia Basin fish and wildlife agencies  
PNUCC

Attachment.

**PRELIMINARY COMMENTS ON SELECTED ITEMS  
IN FY 1987 PROPOSAL FOR BONNEVILLE SPENDING**

Action Item 32.1 (conduit testing): Budgeting \$1.48 million for this action item in fiscal year 1987 is inappropriate in light of the action item. It calls for completion of the conduit testing and evaluation by November 15, 1986, just 1 1/2 months into fiscal year 1987. As a result, nearly all spending should be before FY 1987.

Action Item 34.5 (habitat and passage restoration): Given the information now available, Bonneville may be able to identify expenditures more accurately by identifying and distinguishing major new projects, other new projects, and ongoing projects anticipated in fiscal year 1987. See Program Section 704(d).

Action Item 34.23 (hatchery effectiveness): Council comments will depend on results of the related work plan, to be submitted by Bonneville in October 1985.

Action Item 34.24, 34.25, 34.27, 34.28 (supplementation studies and hatchery releases): FY 1987 spending in this area will depend in part on development by Bonneville of an appropriate work plan for supplementation studies and development by fishery agencies and tribes of an appropriate hatchery-release proposal, both expected by October 1985.

Action Item 38.1 (known-stock fisheries): This item is limited inappropriately to "completion of an ongoing project" without provision for sharing the costs of a short-term electrophoresis demonstration program. The Council amended Program Section 500, after extensive public proceedings and careful deliberation, to call for Bonneville funding of a portion of the costs of such a program to illustrate the effectiveness of electrophoresis as a tool to protect natural Columbia River stocks during the fishing season. The Council concluded that electrophoresis would help protect ratepayer investments in restoring Columbia River stocks. It also decided ratepayers should fund development and demonstration of known-stock fishery techniques, such as electrophoresis, because of the linkage between hydroelectric development and the mixed-stock fishery. The limited duration of the program measure indicates to all parties that this funding would not be an ongoing obligation of the ratepayers. The Council does not view the demonstration program as an indication that Bonneville should provide ongoing funding for all harvest management activities.

Action Item 39.1 (research): Research objectives may be in place by FY 1987. See remarks in cover letter on provisions for program amendments.

Action Item 41.3 (sturgeon research): At three percent of the total budget, this proposal appears disproportionately high. The action item calls for evaluation of ongoing activities and development of a work plan for future activities, by May 1985. We cannot support the proposed amount without reviewing the evaluation and work plan.

Other projects: We cannot ensure Council support for a \$2.64 million expenditure on generally described activities not covered by the program. If Bonneville believes additional fish and wildlife projects deserve Council and ratepayer support, it should propose them in the Council's public proceedings for program amendment. Otherwise, non-program expenditures probably should be limited to administrative support for Bonneville's fish and wildlife division. We also are puzzled by the provision under this item for "NEPA studies related to the construction of the Cabinet Gorge Hatchery," which appears to duplicate earlier funding for the Pend Oreille Hatchery, to be completed by October 1986. (See Action Item 41.4.)



# United States Department of the Interior

BUREAU OF RECLAMATION  
PACIFIC NORTHWEST REGION  
FEDERAL BUILDING & U.S. COURTHOUSE  
BOX 019-550 WEST FORT STREET  
BOISE, IDAHO 83724

Reviewed:	JAN 10 1985
Copies:	10/11/84
NO. 040	REPLY:

IN REPLY  
REFER TO PN 150  
565.

John R. Palensky, Director  
Division of Fish and Wildlife  
Bonneville Power Administration  
P.O. Box 3621  
Portland, Oregon 97208

JAN 8 1985

Dear Mr. Palensky:

Subject: Bonneville Power Administration's (BPA) Fish and Wildlife Budget

Following are our comments on the preliminary fiscal year 1987 fish and wildlife budget.

Yakima Basin Habitat and Passage Restoration.--The schedule as presented agrees with our program at this time.

Other Habitat and Passage Restoration.--It is our understanding that many hurdles remain to be cleared before construction of passage at Enloe Dam could begin.

Umatilla Basin.--We are currently working with the Bonneville Power Administration, the Confederated Tribes of the Umatilla Indian Reservation, and state and Federal fishery agencies on alternatives to modify Three Mile Falls Diversion Dam on the Umatilla River to enhance fishery migration. We understand that funds are included in BPA's fiscal year 1986 budget which could be used for modifications of this structure. As a part of our Umatilla basin investigation, we are proposing fish passage and protective facilities at four major upstream diversions (Maxwell, Westland, Feed Canal, Furnish Canal). Implementation of this work as a part of our overall basin plan will require authorization and funding by the Congress. It may be desirable for BPA to consider funding this work in fiscal year 1987 and subsequent years as an extension of work at Three Mile Falls Diversion Dam. This could be treated as a first phase of the program similar to that in the Yakima River basin. We would be glad to pursue this matter with BPA.

Thank you for the opportunity of reviewing this preliminary budget.

Sincerely yours,

*John W. Keys, III*  
ACTING

Regional Director



United States Department of the Interior

BUREAU OF LAND MANAGEMENT

OREGON STATE OFFICE  
P.O. Box 2965 (825 NE Multnomah Street)  
Portland, Oregon 97208

IN REPLY REFER TO  
6522 (932)  
BPA/FWPI

January 9, 1985

Reviewed: JAN 10 1985
Signature: [Handwritten Signature]
NO. 64/10000

John R. Palensky, Director  
Division of Fish and Wildlife - PJ  
Bonneville Power Administration  
P. O. Box 3621  
Portland, Oregon 97208

Dear Mr. Palensky:

Appropriate personnel in this office have reviewed your "Preliminary Fiscal Year 1987 Fish and Wildlife Program Proposal."

We have no specific comments on the preliminary FY 1987 proposal but anticipate continued cooperation with your staff and other agencies to provide a major fish passage improvement over Enloe Dam. Also, we expect our district personnel to be involved with certain fish passage and habitat projects in the John Day River watershed included in the amended program measure 704(d).

We appreciate the opportunity to comment on the FY 1987 fish and wildlife program proposals.

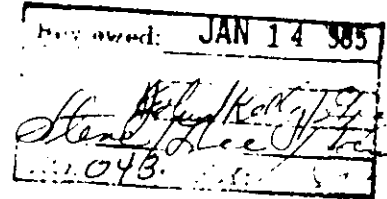
Sincerely yours,

  
William G. Leavell  
State Director

cc:  
DM's Spokane and Burns w/copy of 12/10/84  
BPA letter and three enclosures

Pacific Northwest Generating Company  
Serving the power needs of our member  
rural electric cooperatives

8383 NE Sandy Blvd.  
Suite 330  
Portland, Oregon 97220  
503 255 7248



# PINGC

January 11, 1985

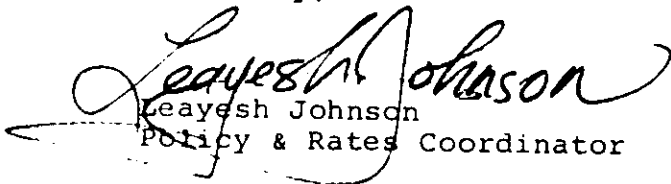
Mr. John Palensky, Director  
Division of Fish and Wildlife - PJ  
Bonneville Power Administration  
P.O. Box 3621  
Portland, Oregon 97208

Dear John:

Bonneville's FY 1987 fish and wildlife budget contains no indication of how much Bonneville would be paying for each smolt produced. In order for Bonneville to provide "equitable treatment for.....fish and wildlife with the other purposes for which (the Federal Columbia River Power) system and facilities are managed and operated" (Regional Act, Section 4) and to act according to "sound business principles" (Transmission System Act, Section 9), these measures should be demonstrated to be cost-effective. Cost/benefit analyses by Bonneville are necessary to balance the Council's recommendations for the fish and wildlife program with the Administrator's other obligations.

Thank you for this opportunity to comment on your budget.

Sincerely,

  
Leayesh Johnson  
Policy & Rates Coordinator

LEJ/sw

Copy to-  
Doug Brawley, PPC  
PNGC Board of Directors



## Department of Energy

Bonneville Power Administration  
P.O. Box 3621  
Portland, Oregon 97208

In reply refer to: PJ

January 15, 1985

Mr. Chuck Collins, Chairman  
Northwest Power Planning Council  
850 SW Broadway, Suite 1100  
Portland, Oregon 97205

Dear Mr. Collins:

The Northwest Power Planning Council, in its amended Columbia River Basin Fish and Wildlife Program (Program), requested the submittal by all Program implementing agencies (including the Bonneville Power Administration (BPA)) of their annual "expenditure and obligation plans and program work plans" (Section 1504, Action Item 39.2). Enclosed with this letter is BPA's FY 1985 Fish and Wildlife Program Work Plan.

BPA has appreciated the participation and input of the Council's Fish and Wildlife staff, who have made themselves available at all relevant stages of plan development. The constructive nature of their input and willingness to consult with BPA on potential issues has facilitated the development of a plan, which we believe will be most useful to both BPA and the Council.

Pursuant to the Action Plan, much of BPA's implementation activity during FY 1985 will be the development of measure-specific work plans, which will direct future activities under such measures (e.g., Section 1504, Action Items 34.5, 34.23, 34.24, and others). The measure-specific work plans, which identify specific projects and the relationship between such projects, are needed to accomplish the objectives of the measure. These projects, when combined with ongoing FY 1985 projects, will constitute BPA's FY 1986 and future fiscal year Action Item 39.2 work plans.

Included in the FY 1985 Fish and Wildlife Program Work Plan are new habitat improvement and fish passage projects identified as a part of the Action Item 34.5 Work Plan. The supporting rationale and background materials (Section 704(d)(1)(A-D) criteria) for these projects will be provided to the Council under separate cover, and can be identified as the "FY 1985 Habitat Improvement and Fish Passage Work Plan (Action Item 34.5)."

In a letter dated December 10, 1985, BPA requested the opportunity to present the annual work plans to the Council. I have been in contact with Ms. Janis Chrisman, Director of the Council's Division of Fish and Wildlife, and

The Bonneville Power Administration  
FY 1985 Fish and Wildlife Program  
Work Plan  
Action Item 39.1

Introduction

On October 10, 1984, the Northwest Power Planning Council (Council) amended the Columbia River Basin Fish and Wildlife Program (Program). A new section was added to the Program (Section 1500: Five-Year Action Plan), which established implementation priority. As a part of the Action Plan, the Council requested the submittal by all implementing agencies of annual "expenditure and obligation plans and program work plans" (Action Item 39.2).

Using Section 1500 action items assigned to BPA as a guide, a limited public involvement process was initiated to identify and scope activities to be funded during FY 1985. The public involvement process included meetings (October 17 and November 14) of technical and policy level fish and wildlife agency, Tribal, land management agency, and utility representatives, from which BPA developed a "Proposed Fish and Wildlife Program Work Plan." The proposed plan was mailed (December 17) to participants at the initial meetings, as well as agency directors, Tribal chairmen, Forest Service regional coordinators, and several other coordinating groups for final review and comment. Comments were requested by January 1, 1985.

On December 19, 1984, BPA transmitted the proposed plan to the Director of the Council's Division of Fish and Wildlife, identifying possible issues associated with implementation of the work plan. On December 16, 1984, key BPA and Council fish and wildlife staff met to discuss and seek resolution to the issues identified in the December 19 letter.

BPA has considered the input of the Council's staff, the Region's fish and wildlife agencies, Indian Tribes, utilities (through the PNUCC Fish and Wildlife Committee), and Federal land managers (the U.S. Forest Service and Bureau of Land Management) in the development of the plan. Comments (both written and oral) have been provided at the two meetings and in response to the proposed work plan (mailed December 17). The development of the FY 1985 plan has been marked by the constructive and cooperative participation of all involved parties.

The work plan is divided into four sections. Each section addresses a segment of the information requested by the Council in Action Item 39.2. The content of each section follows:

- |           |  |
|-----------|--|
| Section 1 | Identification of new projects to be implemented during FY 1985 by project number and short title; |
| Section 2 | Proposed activity during FY 1985 for all actions items specifying BPA involvement;                 |
| Section 3 | Proposed expenditures for all ongoing and new projects, categorized by action items; and           |



DIVISION OF FISH AND WILDLIFE  
BONNEVILLE POWER ADMINISTRATION

Action Proj.				Fiscal Year		
Measure	Item	#	Title	1985	1986	1987
				-----\$000-----		
Other						
704D1	T4	34.5	81-108 Warm Springs Res Baseline Fish Inven	100	200	200
704D1		34.5	83-7 Evaluation of Idaho Habitat Imp Proj	200	0	0
704D1	T4	34.5	83-341 Hood River Passage	400	0	0
704D1	T3M	34.5	83-359 Bear Valley Cr Habitat Improvement	490	250	250
704D1	T3F	34.5	83-415 Alturas Lake Cr Flow Augmentation	550	550	20
704D1	T4	34.5	83-423 Trout Creek Natural Prop Enhancement	200	250	300
704D1	T5T	34.5	83-434 Low Umatilla Channel Modifications	80	30	0
704D1	T5T	34.5	83-436 Three Mile Dam Passage	300	2100	400
704D1	T5U	34.5	83-440 White River Falls Passage	150	4000	200
704D1	T5U	34.5	83-450 White River Falls Passage	200	150	0
704D1	T5A	34.5	83-477 Enloe Dam Passage	200	250	4200
704D1	T5T	34.5	83-834 Umatilla Assessment	125	0	0
704D1	T5I	34.5	84-5 Red R/Crooked R Habitat & Pass Imp	200	350	300
704D1	T3/534.5	84-6	Lolo/Crooked Fk/Eldorado Creek Imp	150	150	150
704D1	TM2	34.5	84-8a Clear/Granite/N F John Day Hab Imp	90	100	150
704D1	TM2	34.5	84-8b Desolation Creek Hab Imp-New FY 85	30	40	40
704D1	T4	34.5	84-9 Joseph Creek, Grande Ronde R, Oregon	200	250	250
704D1	T5T	34.5	84-10 Umatilla River Restoration	150	300	0
704D1	T4	34.5	84-11a Fish/Lake Br Cr/White R/Collawash Fa	550	250	250
704D1	T4	34.5	84-11b Clackamas/Sandy R Hab Imp-New FY 85	50	100	50
704D1	T4	34.5	84-11c Fifteenmile Creek Hab Imp-New FY 85	40	200	650
704D1	T2A	34.5	84-21 Mainstem, Mid Fork, John Day River	200	150	250
704D1	T2A	34.5	84-22 John Day River	150	150	150
704D1	T3K	34.5	84-23 Camas Creek, Idaho	0	100	100
704D1	T3L	34.5	84-24 Marsh/Elk/Upper Salmon River, Idaho	200	250	250
704D1	T4	34.5	84-25 Joseph Creek, Grande Ronde R, Oregon	200	250	250
704D1	T5F	34.5	84-26 Fish Passage, Little Falls Creek	170	0	0
704D1	T3E	34.5	84-28 Lemhi River Rehabilitation, Idaho	200	250	250
704D1	T3D	34.5	84-29 Panther Creek Rehabilitation, Idaho	500	500	500
704D1	T5	34.5	85-52 Tumwater Falls Dam Passage	20	1250	50
704D1	T5	34.5	85-53 Dryden Dam Passage	20	1250	50
704D1	T4A	34.5	85-59 Orofino Creek	200	0	300
704D1		34.5	85-61 Habitat Improvement Evaluation	50	250	250
704D1		34.5	85-70 Little Naches R Channel & Salmon Fls	30	300	0
704D1		34.5	85-71 S Fk John Day R, Mainstem & Izee Fls	200	0	700
704D1		34.5	85-73 Wind R/Layout/Trout/Crater/Cmpass Cr	50	50	50
704D/904D		34.5	85-62 Passage Improvement Evaluation	100	300	350
Subtotal				6745	14570	10910
TOTAL				15465	16830	12090

## ARTIFICIAL PRODUCTION

704I1	34.11	82-18	O&M of Bonifer Springs Acclim Facil	10	20	20
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# COLUMBIA BASIN FISH AND WILDLIFE COUNCIL

LLOYD BUILDING • SUITE 1240  
700 N. E. MULTNOMAH STREET  
PORTLAND, OREGON 97232

PHONE 231-2241  
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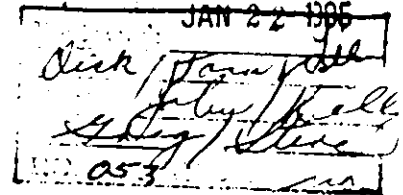
January 18, 1985

OFFICE OF  
EXECUTIVE SECRETARY

TO: John R. Palensky  
Bonneville Power Administration

FROM: Richard J. Myshak, Chairman  
Columbia Basin Fish and Wildlife Council

SUBJECT: BPA FY87 Fish and Wildlife Budget



## GENERAL COMMENTS

We are pleased to have the opportunity to comment on your preliminary FY87 budget for implementation of the Fish and Wildlife Program. In the sections which follow, we offer comments which we hope will be useful in formulating your final budget proposal. Like your listing, these comments are for the most part general in nature, focusing on areas of emphasis rather than project-specific detail. Given the long lead time required in the Federal budgeting process, and the ample flexibility demonstrated by BPA in the past, we feel that the level of detail included in this preliminary budget is adequate.

Since you have asked for suggestions toward improving this process in future years. We would also like to point out one difficulty which we experienced in reviewing this information. In the case of major capital projects, any one of which could make a substantial difference in a single line item, we see a need for a greater understanding of the assumptions about their funding in earlier or later years. For example, in a recent letter to the BPA we encouraged you to provide for funding in FY86 of passage improvements at Three Mile, Dryden, Tumwater and Enloe Dams, and at White River Falls. (Note: a final decision to provide passage at Enloe Dam has not yet been made.) In this preliminary budget under "Other Habitat and Passage Restoration" the narrative indicates that construction at Enloe is included in the \$10.6 million total. Presumably it has been assumed that the other projects will have been completed with earlier year funds, but this is not clear and obviously this information would affect our comments on the adequacy of the FY87 projection. This same comment would apply to other Program areas which may include major capital expenditures, such as "Artificial Production."

Some of the specific comments which follow recommend additional funds under certain Program areas. However, we believe that the total budget is adequate. Therefore, we recommend that these increases be accomplished through a change in emphasis rather than an increase in the total budget.

## Specific Comments

### Mainstem Passage-Action Plan Item 32.1

As the NPPC pointed out in their comments on this item, the Action Plan specifies completion by November 15, 1986. They say that as a result, nearly all spending on this item should be before FY87. We do not expect you to fund an activity in this or any area in conflict with the NPPC's direction. Nor do we expect you to petition the Council to include additional activities within their Action Plan. At the same time, however, the priority which the agencies place on the improvement of downstream survival problems is clear. Our recommendation for this measure in the last amendment process was not for a single study, but for a research program directed at the development and testing of innovative technologies for safely transporting fish deflected out of turbine intakes from the point of deflection to tailwater. Therefore we recommend that, for budgeting purposes, you assume that the Council will accept our recommendation for a greater BPA emphasis on research in this area. In our previous amendment recommendation, we estimated that our fish passage experts could responsibly manage 2-3 such projects totalling \$600-800K annually.

### Water Budget-Action Plan Item 33.1-33.2

The level of funding shown for Water Budget management, research and monitoring seems adequate at this time.

### Yakima Basin Habitat and Passage Restoration-Action Plan Item 34.1-34.3

The level of funding shown for continuing the Yakima Basin Passage Improvement Program is generally consistent with the current projections of the Yakima Basin Technical Work Group and we therefore have no changes to recommend.

### Other Habitat and Passage Restoration-Action Plan Item 34.5

As we indicated in our general comments above, passage improvements at Three Mile, Dryden, Tumwater, and Enloe Dams, and at White River Falls should all be included here unless they have been included in an earlier year.

### Artificial Production-Action Plan Item 34.11-34.18

In addition to the Yakima and Umatilla hatcheries, and the Nez Perce low-capital facility, the John Day acclimation pond is also required by the Action Plan. It is our understanding that it is not included here because it is assumed that it will be completed in FY86. If this is not the case, then the acclimation pond should be added.

Beyond these production facilities which have already been approved by the NPPC, it is likely that by FY87 the constraint on additional new facilities will be relaxed in response to improved harvest management agreements such as the Canadian treaty. Therefore, we recommend that you tentatively include funding for preliminary engineering on at least one or two

additional hatcheries on the assumption that the agencies and tribes will develop and agree on master plans, and the NPPC will approve their inclusion in the Program and the Action Plan.

Improved Hatchery Effectiveness-Action Plan Item 34.23

The overall budget amount for this item in relation to other program areas is appropriate. However, within this area we are concerned that there has been an overemphasis on disease research. While we agree that fish health problems should remain the priority in this section, we also recommend that efforts to address hatchery practices, rearing and release strategies, and genetics be increased.

Stock Supplementation and Hatchery Reprogramming - Action Plan Items 34.24 - 34.28

We recommend an increase in the level of funding programmed for these activities. The \$700K currently included should be sufficient for the Willamette spring chinook study and hatchery reprogramming studies as indicated in the narrative. However, the general work plan for supplementation research, to be developed under Action Item 34.24, should also be considered. The biennium budget of ODFW authorizes \$200K for the Willamette study and another \$500K for similar studies in the Imnaha and Grand Ronde rivers. Assuming that Washington and Idaho will also be involved in research in this area, we recommend a total of \$1.5 million for these activities.

Future Hydroelectric Development - Action Plan Item 35.6

No comment.

Goals - Action Plan Item 36.2

No Comment.

Harvest Controls - Action Plan Item 38.1

The \$70K shown for activities under this Action Item is described as "limited to completion of an ongoing project." We recommend that the budget for this Action Item be increased to include (1) the electrophoresis demonstration program (\$300K), (2) research to improve stock identification methods under Measure 504(c)(2) (\$100K), and (3) known stock fishery demonstration projects under - Measure 504(c)(3) (\$150K).

Other Research - Action Plan Item 39.1

No comment.

Wildlife Mitigation Loss Statements and Plan - Action Plan Item 40.2

Comments, if any, on this element of the FY87 budget will be provided under separate cover.

Wildlife Mitigation Project Implementation - Action Plan Item 40.5

Comments, if any, on this element of the FY87 budget will be provided under separate cover.

Resident Fish - Montana Projects - Action Plan Item 41.1

Comments, if any, on this element of the FY87 budget will be provided under separate cover.

Colville Hatchery - Action Plan Item 41.2

Comments, if any, on this element of the FY87 budget will be provided under separate cover.

Sturgeon Projects - Action Plan Item 41.3

Without a clearer definition of what work would be done under this Action Item it is difficult to comment on the budget. However, we feel that \$1.48 million will be adequate for whatever proposals we might support.

Lake Pend Oreille Hatchery - Action Plan Item 41.4

Comments, if any, on this element of the FY87 budget will be provided under separate cover.

"Other Resident Fish Projects - Action Plan Items 41.5-41.7; .ip

Comments if any, on this element of the FY87 budget will be provided under separate cover.

Other Projects

We recognize that there are some projects, that are not explicitly included in the Program or the Action Plan but which still require BPA funding. We agree with the NPPC, however, that such expenditures should be limited to administrative support activities, such as maintenance of the BPA tagging trailer. However, projects such as determining the Administrator's obligation, production of research fish, a research clearing house, and studies on the effects of spill and pool fluctuations should not be included unless they are developed and adopted as a part of the Action Plan.

*[Handwritten signature]*

ER. DICK MYSHAK



UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL MARINE FISHERIES SERVICE

ENVIRONMENTAL & TECHNICAL SERVICES DIVISION  
847 NE 19th AVENUE SUITE 350  
PORTLAND, OREGON 97232-2279  
(503) 230-5400

January 22, 1985

F/NWRS

L. W. Lloyd, Regional Director  
Bureau of Reclamation  
P.O. Box 043  
Boise, Idaho 83724

Re: Application for Reclamation Withdrawal OR 1434 (Wash.),  
Oroville-Tonasket Unit Extension, Okanogan County, Washington

Dear Mr. Lloyd:

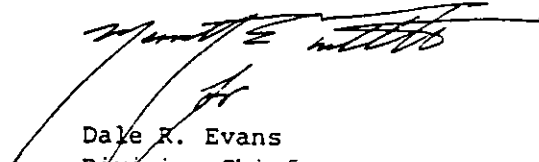
The National Marine Fisheries Service (NMFS) has been informed that the Bureau of Land Management (BLM) has recommended denial of the Bureau of Reclamation's (BR) May 3, 1977 application for reclamation withdrawal of lands adjoining Enloe Dam on the Similkameen River. NMFS' primary mission in the upper Columbia Basin is the preservation and enhancement of anadromous fishes and their supporting habitat. Therefore, we fully support the BR's land withdrawal efforts and believe that anadromous fishery resources in the Columbia Basin would be best served by reversion of the lands in question to the public domain for the following reasons:

- 1) The report on the anadromous fishery study referred to in your July 21, 1983 letter to the BLM confirms the presence of a significant and potentially very important amount of anadromous fish spawning and rearing habitat in the Similkameen Basin.
- 2) The Northwest Power Planning Council has recognized the anadromous fish production potential of the Similkameen River and has stipulated that the Bonneville Power Administration should provide funding for anadromous fish passage at Enloe Dam. Of the three proposed fish passage alternatives, dam removal, laddering, and trap and haul, NMFS believes that dam removal would be the most feasible and cost-effective alternative. Additionally, the Bureau of Reclamation identified dam removal as the preferred alternative for fish enhancement in the December 14, 1976 Environmental Impact Statement on the Oroville-Tonasket Unit Extension. We are concerned that retention of title to the lands in question by the Public Utility District No. 1 of Okanogan County (PUD), and rehabilitation of the dam for hydropower production could forever preclude dam removal.
- 3) Fish passage at Enloe Dam and establishment of anadromous fish runs in the Similkameen River Basin would serve as offsite mitigation for juvenile fish losses occurring at hydropower projects on the mainstem Columbia River.



In view of ongoing major efforts to restore and enhance anadromous fish runs throughout the upper Columbia River Basin, we strongly urge you to appeal this decision and request that the BLM forego action on your application until the controversy surrounding the PUD's compliance with the R and PP patent is settled.

Sincerely yours,



Dale R. Evans  
Division Chief

cc: Bill Cook and Mark Snieder, NPPC  
Larry Everson, BPA ✓  
John Marsh, CRITFC  
Director, BLM, Oregon State office  
Jerry Marco, Colville Tribe  
Bob Tuck, Yakima Indian Nation  
Yakima Indian Nation  
Bureau of Land Management, Oregon State Office



# United States Department of the Interior

BUREAU OF RECLAMATION  
PACIFIC NORTHWEST REGION  
FEDERAL BUILDING & U.S. COURTHOUSE  
BOX 015-550 WEST FORT STREET  
BOISE, IDAHO 83721

IN REPLY  
REFER TO PN 410  
721.

FEB 12 1985

## Memorandum

To: State Director, Bureau of Land Management,  
Oregon State Office, 825 Multnomah Street,  
Portland, Oregon 97208

From: Regional Director, Boise, Idaho

Subject: Application for Reclamation Withdrawal, OR 17434 (Wash),  
Oroville-Tonasket Unit Extension, Washington

This is in response to your November 28, 1984, letter. We appreciated the extra time allotted us to respond.

Reclamation does not agree with BLM's finding and recommendations contained in your above-mentioned letter. We wish to continue our withdrawal request and encourage BLM to pursue a reversion in title to the lands situated at Enloe Dam as provided for in the Recreation and Public Purposes Act (R&PP) regulations 43 CFR 2741.8(a)(3). These regulations provide that patents issued under the Act revert to the United States if "the lands have not been used for the purposes for which they were conveyed for a 5-year period." The Enloe Dam facility has not been utilized for a power generating plant since 1959 nor have recreation facilities been developed pursuant to the Act. Non-use by the Okanogan Public Utility District (OPUD) far exceeds the 5-year period and title to the land should revert to the United States. We are reluctant to give up our withdrawal filing date without assurances that we can obtain adequate interest in the land from BLM to complete our authorized project.

A review of our files discloses that we have submitted the documentation required by 43 CFR 2310.1-2 and 2310.3-2. Copies of our letters dated May 3, 1977, and August 10, 1977, are enclosed. An Environmental Impact Analysis (EIA) is also enclosed. This document specifically addresses the proposed withdrawal and fish passage at Enloe Dam. These letters and EIA provide adequate information on each item required in withdrawal application. We are certainly willing to furnish additional specific information if you so request.

In this connection we are enclosing a copy of a letter signed by the Deputy Assistant Secretary, Land and Water Resources, approving the application for withdrawal in accordance with Part 603 DM 1.1A.



The Interagency Agreement (IA) between our Bureaus specifically states that withdrawal of surface management is appropriate for meeting fish and wildlife requirements (see IA, Section 6.A, paragraph 4). Fishery enhancement is the proposed use of the land and requires Reclamation jurisdiction over the land surface.

It is also our understanding that the Interior Board of Land Appeals in a decision dated November 14, 1975, (IBLA 75-287) dismissed all the OPUD arguments supporting their non-compliance with the terms of the R&PP Act patent and encouraged BLM to execute reversionary action required in the patent.

The Northwest Power Planning Council has developed a Fish and Wildlife Program under authority of the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Public Law 96-501). Measure 704(e)(1) table 5(A) of the program provides for fish passage at Enloe Dam. Adequate interest in the surface rights of the land at Enloe Dam is needed to accomplish this measure. A progress report on this measure has been completed and is available from the Council. We encourage you to discuss this issue with them. We have also received a letter from the National Marine Fisheries Service, copy enclosed, supporting USBR's withdrawal effort.

We believe information contained herein documents our concern and will foster action by BLM to revoke the patent held by the OPUD, thereby permitting a Reclamation withdrawal. This letter may be used as part of the file submitted to your Director. As previously stated, we will be happy to furnish any specific information required by 43 CFR 2310.

L. W. LORR

#### Enclosures

cc: Northwest Power Planning Council  
800 Southwest Taylor, Portland, Oregon 97205  
(w/o enclosures)

National Marine Fisheries Service  
847 Northwest 19th Avenue, Third Floor  
Portland, Oregon 97323 (w/o enclosures)

Larry Everson  
Bonneville Power Administration  
1002 Northwest Holladay Street,  
Portland, Oregon 97323 (w/o enclosures)

Columbia River Inter-Tribal Fish Commission  
2705 East Burnside, Suite 97214  
Portland, Oregon 97214 (w/o enclosures)

MAR 18 1985

Planning Branch

14 March 1985

To: John Palensky  
Bonneville Power  
Administration, PO  
Box 3621, Portland Or  
97208

From: John Wakeman, Environmental Coordinator  
NPSEN-PL-ER  
Seattle District, U.S. Army Corps of Engineers  
P.O. Box C-3755  
Seattle, Washington 98124-2255

This transmits the memorandum of the minutes of the 26 February meeting on the Similkameen River Multipurpose Feasibility Study. This meeting was held to provide information on study findings and future scheduled studies, and to provide an opportunity to add your input to the studies. I would also like to invite members of your staff to two atsite working meetings. The meetings will emphasize discussion of significant resources and the scope of the planned studies. We will meet in the Okanogan County PUD Number 1 Building on 1331 Second Avenue North in Okanogan, Washington on March 26, 1985, at 2 pm. On March 27, we will visit the site, leaving the Okanogan PUD office in Oroville at 9 am.

I have previously telephoned your staff to notify them of the planned meetings. If you have questions on the study, please contact me at commercial telephone (206) 764-3624 or FTS 399-3624.

*John Wakeman*

14 March 1985

## MEMORANDUM FOR RECORD

SUBJECT: Agency Coordination Meeting, Similkameen River Multipurpose Dam Feasibility Study

1. Purpose. The meeting was held 26 February 1985 at Seattle District Corps of Engineers offices to inform agencies of current progress and get input on future economic, hydrologic, geologic, and environmental investigations to be accomplished. These studies, when complete, will form partial basis for the feasibility report, an EIS, a Clean Water Act Section 404(b)(1) evaluation, and a biological assessment of potential impacts to endangered species. Another, similar meeting will be held in late March at the study site to acquire further input, to view the study area and do more detailed scoping of the environmental efforts. The minutes of the present meeting will be mailed to participants along with an invitation to the second meeting. The subsequent meeting will also include field representatives of the agencies, who will also receive a copy of these minutes.

2. Attendees included:

- a. Corps of Engineers, Seattle District, PO Box C-3755, Seattle WA, 98124-2255:
  - John Wakeman, Environmental Coordinator for study, Environmental Resources Section, (206) 764-3624 or FTS 399-3624
  - Noel Gilbrough, Study Manager for study, Navigation and Water Resources Planning Section, (206) 764-3652 or FTS 399-3562
  - Ron Bush, Chief, River Basins Unit, Environmental Resources Section
  - Jack Thompson, Chief, Fish and Wildlife Unit, Environmental Resources Section
- b. Bonneville Power Administration, PO Box 3621, Portland, OR 97208
  - John Palensky, Portland, (503) 230-4981
  - Don Rempe, Seattle, (206) 442-0951
- c. Environmental Protection Agency, Region X, 1200 Sixth Avenue, Seattle, WA
  - Carl Kassebaum, (206) 442-1447
  - Brian Ross, (206) 442-8516
- d. National Marine Fisheries Service, 847 Northeast 19th Avenue, Suite 350, Portland, OR 97232
  - Charles Bennet, (503) 230-5428
  - Steve Morris, (503) 230-5430
- e. Fish and Wildlife Service, Division of Ecological Services, 2625 Parkmont Lane, Building B-3, Olympia, WA 98502
  - Chuck Dunn, Field Supervisor, (206)-783-9440, FTS 434-9440
  - Lynn Childers, FTS 434-9440

MEMORANDUM FOR RECORD

SUBJECT: Agency Coordination Meeting, Similkameen River Multipurpose Dam Feasibility Study

- g. IEC Beak, Inc. 10751 Shellbridge Way, Suite 120, Richmond, British Columbia, Canada  
Len Fanning, (604) 273-1601
- h. Washington Department of Game, 600 North Capitol Way, Olympia, WA 98504  
Dave Gufler, (206) 753-3050
- i. Washington Department of Fisheries, 115 General Administration Building, Olympia, WA 98504  
Bob Gerke, (206) 753-6588
- j. Washington Department of Ecology, Olympia, WA 98504  
Dick Szymarck, (206) 459-6122  
Jim Bucknell, M/S PV-11, (206) 459-6115
- k. Yakima Indian Nation, Fisheries Resource Management, PO Box 151, Toppenish, WA 98948  
Larry Wasserman (509) 865-5121 ext. 672
- l. Okanogan Public Utilities District No. 1, PO Box 912, Okanogan, WA 98840  
Larry Felton

Also invited to the meeting: Okanogan Board of County Commissioners, Pacific Northwest Power Planning Council, Oroville-Tonasket Irrigation District, Colville Confederated Tribes, Bureau of Reclamation, and British Columbia Ministry of Environment.

3. Summary of discussion after Corps presentation. Cross-references with the other sections of the memorandum occur if there is a substantial amount of background information on the issue presented at the meeting.

a. Hydraulic concerns. Approximately 100,000 acre-feet would be stored from the Similkameen River's discharge into the Okanogan and Columbia Rivers, primarily during the spring freshet period. This should be coordinated with the Pacific Northwest Power Planning Council, since it has potential effects on salmonid smolt migration in the Columbia River system.. Reference: 4b and 7a.

b. Power supply concerns. The Northwest Power Planning Council has revised its forecasts on the length of time there will be a regional energy surplus. The Corps should consider these figures in its economic estimates of power benefits accruing to the planned dam or dams.

c. It is particularly important that the Corps address smolt survival at the dam(s) on the Similkameen River early on, and keep the Pacific Northwest Power Planning Council informed of the probable impacts on its regional fish and wildlife plans. The establishment of sustainable anadromous fish runs in the Similkameen River is high priority in the Council's plan. The Corps should meet with the Council and BPA. Specific problems identified include lack of effective technology for providing for smolt outmigration and the possible residualizing effect of a long, slow-flow reservoir with probable thermal stratification during outmigration. It was also suggested that the Corps examine the BPA/FWS study on the Cabinet Gorge Hatchery. Reference: 7b.

d. The planned Habitat Evaluation Procedure (HEP) should be expanded to include more than the study area (which is the region inundated or adjacent to it). The technique should also consider possible mitigation lands. The HEP should contain ten or twelve species groups in its coverage. Reference 7c.

MEMORANDUM FOR RECORD

SUBJECT: Agency Coordination Meeting, Similkameen River Multipurpose Dam Feasibility Study

d. Around Palmer Lake and Nighthawk, it is important to look at water table effects and accompanying socio-economic impacts. It will be necessary to assess the effects on riverine and lacustrine water temperatures, dissolved oxygen, bacterial contamination from septic systems around Palmer Lake and Nighthawk and potential for meeting other water quality standards. References: 5, 7e and 7f.

e. The Corps should thoroughly coordinate the Instream Flow Incremental Methodology techniques to be used for measuring potential fisheries habitat in the Okanogan and Similkameen Rivers. Reference: 7a

f. The Washington Department of Ecology has recently established minimum instream flows in the Okanogan River. The Corps should address whether these flows would be met, and coordinate with WDE regarding water rights in the system.

4. Engineering studies and general conception of the study plan to date. The Seattle District, Corps of Engineers, has determined that the multipurpose project would benefit hydropower generation, irrigation water availability in the growing season, flood control, and recreation interests. The project sponsors are Okanogan PUD No. 1, the Oroville and Tonasket Irrigation District and Okanogan County.

a. Siting. Concept and design studies to date have included two siting alternatives for the single or multiple dams: (1) a single high dam at a site near the existing railroad bridge at river mile (RM) 6.6 of the Similkameen River, and (2) three dams, including the existing Enloe Dam (RM 8.3) and smaller dams at RM 6.6 (the railroad bridge) and RM 10.4 (Shankers Bend). The confluence of this river with the Okanogan at Oroville, Washington, is RM 0. See figures 1 and 2. The large dam alternative at the railroad bridge site appears currently to be the most economically feasible of those considered, with construction costs of \$106,000,000 and a benefit-to-cost ratio of 1.35. However, the Okanogan PUD has requested that economic analyses be re-examined for the three dam alternative as well.

b. Elevations of pool and related design characteristics. The dam would rise 230 feet from the riverbed. It would contain a 63 Megawatt (MW) powerhouse and the reservoir would have approximately 100,000 acre-feet of storage. The normal nonflood elevation of Palmer Lake is 1,145 feet above mean sea level. The yearly Palmer Lake crest elevation during the spring freshet is between 1,160 and 1,165 feet. Detailed environmental analysis will consider a reservoir pool elevation of 1,155 feet. Impacts due to inundation are being considered at this time at the 1,115 foot elevation, although it is known that the elevation will be somewhat less downstream due to gradient. An economic sensitivity study of a pool elevation of 1,145 feet will also be done, at the request of the community around Palmer Lake. This pool elevation would have no effect on Palmer Lake. A pool of 1,155 feet would raise the summer and fall surface of Palmer Lake by approximately 10 feet and affect the inundation pattern of lands along the river, and to the north and south of Palmer Lake. The period of inundation of these lands would increase from a month or less without the project to approximately 3 to 9 months.

MEMORANDUM FOR RECORD

SUBJECT: Agency Coordination Meeting, Similkameen River Multipurpose Dam Feasibility Study

The reservoir of the single large dam would be thermally stratified, and designs are being considered for multi-level intakes in the reservoir that could be used for temperature regulation in the Similkameen and Okanogan Rivers, where there are temperatures in excess of 70° F may block passage of salmonids in the late summer months.

Fish passage facilities have been included in the preliminary designs for the large dam. The present plan, which will be thoroughly coordinated with agencies, is an upstream cableway and a downstream gulper facility similar to the one in use at Foster Dam on the Willamette River in Oregon.

The three dam alternative would also have a 1,155 foot pool above the Shankers Bend dam, but lower (as yet undefined) pools in the lower dams. Enloe Dam would probably be rehabilitated first, followed by the development of the Shankers Bend dam and the railroad dam. Enloe Dam would, with the Shankers Bend dam on line, probably serve as a reregulating dam. Similar, but possibly slightly less, power generation would occur with the three-dam alternative.

The upper reservoir would have less than one-third of the storage of the large dam alternative, or about 30,000 acre-feet. This may diminish the amounts of obtainable irrigation and flood control. The three-dam alternative would probably not provide enough deep, cold stored water to provide temperature control for downstream river flows.

Fish passage facilities would be provided as well for the smaller dams.

5. Future engineering studies and schedule of completion of feasibility study.

More refined economic data will be obtained on both the single large dam and the three-dam alternatives. These will include flood control benefits, irrigation benefits (this study will be done by the U.S. Bureau of Reclamation), hydropower benefits, and social impact studies.

In addition, the Corps will accomplish the following hydrologic studies:

- o Develop the 10, 50, 100, and 500 year frequency flood water surface profiles of the affected area below the dam (no flood control would be obtained upstream of the railroad bridge).

- o Determine the flood control routings of water at the dam to provide optimal flood control.

- o Develop a model of the reservoirs for each dam siting alternative which will predict temperature according to depth and seasonal inflow. This would provide information for the design of a multipurpose intake for downstream thermal regulation.

Hydropower studies will be carried out on atsite and downstream power generation potential.

Hydraulic design studies will include sediment analysis and spillway and sluiceway design.

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The schedule for the completion of these studies as well as the environmental studies is as follows. By October, 1986, most detailed studies will be completed, and report preparation will begin. In September, 1987, public and agency review of the draft feasibility report and environmental documents will occur. Submittal of the revised documents to Higher Authority will occur about March, 1988.

6. Environmental studies to date. Environmental studies are currently being planned or are underway to examine the environmental impacts of the recommended plan. Inventory level studies that have been accomplished include fisheries studies by the Corps' National Environmental Policy Act (NEPA) cooperating agency, BPA; a vegetation survey to be utilized at a later time in a Habitat Evaluation Procedure (HEP); significant wildlife resources to be examined; hazardous waste testing, water quality impacts, and toxicity to aquatic biota of potential inundation of mine wastes bordering the river at Nighthawk, Washington; and a cultural resources ethnographic survey for the US and Canadian Similkameen River.

a. Fisheries studies. The issue of fish passage above Enloe Dam is complicated, and it is important to bear in mind that Bonneville Power Administration (BPA) has two distinct roles in the present Corps of Engineers feasibility study. First, BPA has cooperating agency status under the National Environmental Policy Act, and will assist in the guiding and preparing the Environmental Impact Statement (EIS) for the multipurpose dam feasibility study. BPA's interest as a cooperating agency is to reduce paperwork on its power marketing and powerline rights-of-way environmental documents, and to support the goal of fish passage upstream of Enloe Dam that it is pursuing in cooperation with the Northwest Power Planning Council. 7

Second, as a separate action that nevertheless could affect the subject multipurpose dam feasibility study, BPA has commissioned its contractor, IEC Beak, Inc., to conduct fisheries habitat studies in the U.S. and Canadian Similkameen River reaches in order to determine the feasibility of establishing a run of steelhead and/or salmon above Enloe Dam. These studies examine whether such a run could be self sustaining, or artificially sustainable through periodic planting of juveniles above Enloe. The 1984 IEC Beak, Inc., progress report concluded that provision of fish passage at Enloe Dam is justified because it would provide access to extensive spawning and rearing areas. The same document indicates a wide variety of U.S. and Canadian resource agencies' and Indian tribes' opinions on whether steelhead and salmon passage should be allowed.

The BPA studies, including a NEPA evaluation of fish passage at Enloe Dam, should be completed this year. If results are positive, agency agreement and political issues are resolved and an effective technology can be agreed to, passage for steelhead could be in effect as early as 1988. This is approximately the same date as the completion of the subject multipurpose dam Feasibility Study. Fish passage facilities that represent best available technology would be recommended to the Corps' Higher Authority with the

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completed Feasibility Report if it concludes there is a Federal interest in the multipurpose dam or dams, and should fish passage be implemented or approved prior to the completion of the subject study.

The BPA plans for refitting Enloe Dam with some of the alternative fish passage facilities such as a ladder appears at first glance to be inconsistent with the single large dam siting alternative, which would inundate Enloe Dam. Whether this is actually inconsistent would depend on the economic life of the passage facility (the single large dam would not be constructed for at least 10 years) and the passage alternative. Truck and haul facilities might be easily adapted to the large dam alternative without much economic loss.

b. A vegetation survey of the site was conducted by Ecological Services Division of Fish and Wildlife Service. Four vegetation categories were identified below the 1,230 foot (400 meter) topographic contour in the river valley and around Palmer Lake: forested, upland, riparian and wetlands, and agricultural. Vegetation of particular value as wildlife habitat occurs upstream of Nighthawk, Washington. For example, deciduous and mixed deciduous and evergreen forest consisting of black cottonwood, paper birch, redosier dogwood, and alder could provide thermal cover and browse for deer as well as habitat for beaver, mink, and other animals. Throughout the study site, patches of ponderosa pine forest may also be used by deer. Grass pastureland and pond areas to the north and south of Palmer Lake would be affected, and presently supports migratory waterfowl, small mammals and avian raptors. An extensive riparian deciduous shrub zone both upstream and downstream of Nighthawk, consisting of serviceberry, wax currant, ocean-spray, and other plants, provides habitat for upland birds such as quail, chukar and pheasants in wintertime. Downstream of Nighthawk, upland sagebrush grassland areas consisting of big sage, three-spined sage, and bitterbrush, provide mule and white-tail deer winter forage, and support badgers, coyotes, bobcats, and chukar populations. The 1,155 foot pool of the single large dam alternative would inundate approximately 2,197 acres of land, including 263 acres of forested area, 577 acres of vegetated and nonvegetated upland, 1,362 acres of riparian plus wetland areas, and 15 acres of agricultural (orchard) area. The 1,145 foot pool would only inundate riverside vegetation downstream of the town of Nighthawk, and would not inundate the lands around Palmer Lake. The three-dam alternative would resemble the large dam, 1,155-foot pool alternative upstream of Shankers Bend since it shares that pool elevation. Downstream it would differ considerably from the big dam alternative, since the pools of Enloe Dam would be the same as presently, but the railroad bridge dam's pool would be quite a bit lower than the large dam's.

The information developed in the vegetation survey will be used in the Habitat Evaluation Procedure (HEP): see next section for further information.

c. The Corps investigated the potential impacts on water quality and aquatic life that could potentially occur from changing inundation patterns of a possible hazardous and toxic waste site. The Kabba Texas Mine, a-presumed abandoned lead and silver mine upstream of Nighthawk, is designated by the Washington Department of Ecology (WDE) as a priority pollutant site. The mine



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tailings constitute the left bank of the river for several hundred feet, and have a distinctive chrome-yellow or yellow-white color. In consultation with WDE and EPA, the soils at different levels in the tailings pile and in the riverbed downstream of the site were examined using Extraction Procedure (EP) toxicity protocols and elutriate analysis. The tests were run for metals (slightly different groups of metals in each) and for cyanide, which last is often used in processing this kind of ore.

The EP toxicity protocol tests for priority pollutants to determine if potential toxic or hazardous conditions exist, using Resource Conservation and Recovery Act (RCRA) guidelines, as described in the Washington Administrative Code (WAC) 173-300. It is a mild acid extraction, and applicable standards are several times the drinking water levels. If positive results are obtained, a possible violation of drinking water standards might occur through inundation. The only elements that were detected above background levels were cadmium and lead. No tested elements were above the WDE hazardous criteria, but cadmium was close.

The elutriate test is an extraction procedure using river water (at ambient instream acidities, around pH 8.2 in this case). It tests 13 metals and cyanide (in this case) to determine if primary drinking water standards would be violated. Additionally, during the extraction, it was noted that the midbench level of the pile had a very low resulting pH. Extrapolating from the extracted volume back to the interstitial soil pH, it could be as low as 2.0. Thus, this one region of the mine tailings, which is higher than the probable inundation contour, could be designated as hazardous on the basis of the characteristic of Corrosivity (WAC 173-300). Since there are no local geological deposits that could account for this condition, it may be that somebody is actively reworking the tailings pile. This activity could have current, damaging effects on the river biota. This middle bench area alone of the tested stations at the site, had high enough metal concentrations to be dangerous. This is probably because the acidification makes the metals readily soluble in river water. Nickel, cadmium, thallium and zinc were all considerably above the drinking water standards, and cadmium was 100 times it.

It should be borne in mind that the hazardous conditions noted on the middle bench would not be directly involved in the currently-conceived plan. However, foundation and structure analysis will occur to assure that this portion of the tailings would not be caused to slide into the river by the reservoir conditions, and the information has been provided to WDE and EPA, who may wish to take action sooner than the current Corps' feasibility study plan allows.

The impacts of flooding the lower bench were further analyzed. Impacts to water quality, based on dilutions expected and reasonable exchange coefficients would not cause exceedance of water quality standards to the surface waters in the Similkameen River. Because a clay layer was found at the site of the mine, it was suggested that downstream effects on the groundwater supply for the town of Nighthawk would be minimal also. Two potentially significant impacts were identified: the cadmium and copper ion

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concentrations in the river and those anticipated with inundation of the lower bench were both above the EPA standards for toxicity to aquatic life. This suggests present chronic toxicity may exist, and that it would be somewhat worse with additional tailings flooded or mobilized by wave action from the riverbank. Actions to limit the inundation or remove the lower level of the tailings may be required to avoid this impact. Additionally, these findings could have implications for the proposed removal of Enloe Dam, which would move the trapped sediments, which possibly contain metals in concentrations similar to those of the riverbed, downstream en masse into the lower Similkameen and Okanogan Rivers.

d. The Corps contracted with a British Columbia archeological firm to do an ethnohistoric survey of the Similkameen band of Indians, many of whom presently live in British Columbia. The substantial amount of information gathered consists of personal and family history, place names, legends of creation of landforms in the area, hunting and fishing places and methods, and other information that will assist in identifying significant historic and cultural elements in the area.

7. Planned environmental studies. Fish and wildlife studies will inventory utilization of habitats to be affected by the alternative pool elevations and information will be used for predicting incremental damages and formulating mitigation. Fisheries habitat assessment will utilize Instream Flow Incremental Methodology (IFIM) in the Similkameen River below Enloe Dam and in the Okanogan River below Oroville, Washington. Information from these studies will serve to provide information for avoiding impacts, setting potential dam operations and measuring impacts to the river reach from the damsite to Enloe Dam that would potentially be inundated by the reservoir. Further studies required for determining effective means of fish passage will be carried out. Resident fish, waterfowl and game birds, deer and endangered species will also be investigated. A Habitat Evaluation Procedure (HEP) will place values on wildlife habitat lost, altered or improved, and information on possible mitigation sites be developed. Modelling of thermal stratification in the reservoir will be done to support design of multi-level intakes at the dam and to assure that instream temperature regimes below the dam may be met or improved to benefit fish, which may be limited by high temperatures during spawning periods. Further studies of the potential of toxic and hazardous materials in dumpsites, the abandoned powerhouse below Enloe Dam, and a former pesticide warehouse are planned. Cultural resources studies will investigate and evaluate potential historic and prehistoric sites in the study area.

a. Instream flow studies will be conducted using the joint Corps-Fish and Wildlife Service IFIM to determine fish habitat present and potentially available, potential changes in fish production with the project, and to identify possible mitigation. Information required for such studies includes flows, depths, substrate, and habitat-preference for some or all of these fish species: summer chinook, sockeye, steelhead, smallmouth bass, whitefish, rainbow and brown trout. The areas of particular interest in the river are:

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- o Enloe Dam to the railroad bridge, a reach which would be inundated if the big dam concept were implemented, and which has some native summer chinook spawning: 12 redds were counted by WDF in 1984 in this river reach;

- o the railroad bridge to Oroville is a heavily-used reach for summer chinook spawners: 301 redds occurred in 1984 between Oroville and Enloe Dam, with most of these below the railroad bridge in a region affected by the discharges of the dam at the railroad bridge site; and

- o the Okanogan River from its confluence with the Similkameen to the approximate downstream point where the base flow is not changed more than 10% on a mean monthly basis.

Figure 3 shows the presently-conceived relationship between some of the modes of operation of the dam and the possible flows. The figure overlays the surface of Palmer Lake elevation (stippled line) on the elevation at the single, large downstream dam. (The relationship between the lake and the dam elevation is not presently known, and there are two elevation scales in this illustration.) Filling would occur in the freshet period, and the pool would be maintained near maximum (depending on hydropower need) for 3-4 months in the irrigation mode, or for 8-9 months in the hydropower mode. The operation would probably be a composite of these two scenarios. The bottom of the figure indicates the approximate influence on natural flows in the river: for instance, the hydropower mode would increase flows during the period December to January, both modes would decrease the flows during the freshet period, and the irrigation mode would potentially increase the flows during August through October. The operation would provide flood control during the winter-spring months. The dam will be operated so as to provide the state minimum instream flows throughout the year.

Impacts owing to this, or other proposed modes of operation would be evaluated against the IFIM results. There are potential positive and negative impacts to fisheries resources inherent in the operation. For example, the irrigation operation could increase downstream flows during summer chinook in-migration and during fry emergence; steelhead could be affected by decreases in peak flows after spawning and prior to emergence of fry.

b. Further fisheries studies. Participants at the meeting noted that the river would be a lakelike reservoir for as much as 13 miles. The lesser water movement in the reservoir, possibly coupled with the thermal stratification, could lead to conditions that make fish downstream migration difficult to obtain with the available technology. Therefore, a high priority for studies would be to determine what the reservoir physical and biological conditions would be, and investigating the implications for providing effective smolt migration facilities. Some questions that would need to be examined follow.

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o What would be the thermal and hydraulic conditions in the reservoir or reservoirs that might cause the fish to residualize or avoid the impoundment?

o What is known about the timing and behavior of steelhead, summer chinook, and sockeye outmigration from contiguous watersheds? Specifically, how do anadromous fish respond to lakes in the Canadian Okanagan lake chain?

o What available fish outmigrant collection or passage facilities would be effective in these conditions?

o If none are deemed to be effective, who are persons with expertise that could design such a facility?

Available information will also be examined on the following resident fish species: rainbow and brown trout, small-mouth bass, whitefish and freshwater lingcod (burbot).

c. Habitat Evaluation Procedure. Fish and Wildlife Service will accomplish a HEP on the study area. This procedure establishes a number of guilds of animals to represent the utilization of kinds of habitats, and, by applying these guild's known habitat preference, weights the affected habitat in order to derive a value of habitat units. The change in available habitat units due to implementation of a project is used to evaluate alternatives and in establishing extent of impacts and designing mitigation.

Participants at the meeting commented that the HEP plan discussed did not specifically include HEP coverage of possible mitigation sites. This will be added to the plan. Possible sites for wildlife mitigation have been identified. Lenton Flats (figure 2) are nearby alkali flats with some natural springs. Possible mitigation could include removal of salts and development of the springs, vegetation plantations and irrigation. Another plan involves pumping irrigation water up draws along the river to create denser vegetation that would provide food and cover for animals. Input on this and other potential mitigation sites would be appreciated.

d. Wildlife Studies. The following table summarizes the major wildlife groups identified as significant resources and studies that would be carried out on them.

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CATEGORY	SIGNIFICANT RESOURCE	STUDIES PLANNED
Big Game	Mule and whitetail deer	Winter range study, seasonal usage of area including fawning, and HEP
Furbearers	Beaver, muskrat, coyote, raccoon, mink, weasels, bobcat	Hunter and trapper surveys.
Upland game	Chukar, ringnecked pheasant, California quail, blue and ruffed grouse, morning doves, Hungarian partridge	Comparison to data available from Wells Dam and Snake R. and lower Columbia R. data on effects of riparian habitat loss. Roadside censuses in spring, and seasonal flushing censuses for one year.
Waterfowl	Canada goose, mallard, cinnamon teal, blue-eyed teal, wood duck, common goldeneye, Barrow's goldeneye, hooded merganser, ring-necked duck, bufflehead, widgeon, redhead duck	WDG nesting survey data for geese. For others, a one year survey of spring nesting and fall population counts.
Sensitive, Threatened and Endangered Species	Potential for 74 animal species in study area.	Surveys for presence.
	Of the 15 birds, 7 are raptors: bald eagle, golden eagle, northern goshawk, Swainson's hawk, merlin, prairie falcon, and burrowing owl	Bald eagle counts, nesting surveys, and roosting and feeding  Data gathering primarily on prey species as it is determined they would be effected by the plan.
Human use	Hunter and trapper days, other modes of recreation including fishing for resident fish.	Use surveys

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e. Toxic and hazardous waste studies. A number of sites of potential hazardous or toxic waste have been identified in the area.

The powerhouse below Enloe Dam was closed down in 1959 and subsequently much of the generation equipment was removed. There is a potential for polychlorinated biphenyl (PCB) presence in the remaining equipment and in the soil at the site. (This is a current problem as well as a with-project problem, for oily residues can be seen to be leaking into the river from the bridge at the powerhouse.) The single large dam alternative would inundate Enloe dam and the downstream powerhouse. At high pool, Enloe dam would be 30 feet deep, and at low pool the dam would just be visible above water. Thus, the powerhouse would always be inundated. The three-dam alternative would not inundate the powerhouse, but instead result in its reactivation.

There are two sites of warehouse fires near Oroville, Washington, that Mr. Mark Turner, President of the Save our Similkameen (SOS) group has suggested may be within the region of influence of the planning study. Agricultural chemicals, possibly including fertilizers and biocides, may have been disposed at site or nearby. The Northwest Wholesale Warehouse burned about 1960. The Chamberlin Warehouse burned eight or ten years ago.

When the Oroville golf course was constructed, it covered the site of a former landfill for the surrounding communities. It is likely that agriculture chemicals such as biocides and domestic wastes were disposed there. The site appears to be the one listed on the EPA ERRAS database as a potential hazardous site. The golf course site was formerly cut through with deep gullies. On the riverward slope, the gullies may be seen to carry runoff from watering of the golf course. The potential impacts with the one-large-dam alternative would include the periodic inundation of the former landfill with resulting solubilization or transport of materials there. It presently appears that the landfill would not be inundated with the lower pool of the three-dam alternative; nevertheless, the potential for contamination of the smaller reservoir from irrigation runoff should be considered, if it is determined that toxic or hazardous chemicals could exist at the site.

The planned studies will include collection of informant information on the potential of contamination due to the implementation of the planned dam or dams near these sites. EPA and WDE records will be examined, and coordination will occur to determine steps that need to be taken.

f. Water quality studies. The previously-mentioned thermal model of the reservoir(s) will determine conditions in the impoundment and provide information for design of multi-level intakes. It is hoped that this reservoir plan would allow temperature regulation in the Similkameen and Okanogan Rivers to benefit fish. Further information will be gathered on the potential risk of nuisance algal blooms occurring in the reservoir.

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g. Cultural resources studies will continue, with reconnaissance to identify sites of prehistoric and historic value. Historical studies will center on the mining history of the area, because this aspect may be directly related to location of further potentially hazardous mined materials. Indian studies and coordination will seek further Native American input on plan impacts to cultural history and heritage. The magnitude of cultural resources concerns for follow-on stages of project study and development will be assessed.

9. Follow-up actions. As a result of the meeting and plans prior to the meeting, a series of workshops are planned onsite for further scoping of the studies to be done. In addition, the Corps will prepare for coordination with the Northwest Power Planning Council on the impacts to its fish and wildlife plans for the Columbia River and tributaries.

Wakeman

cc:

Dice (ERS)

Bush/Wakeman/ERS RB File (Similkameen)

Gilbrough (NCP)

Thompson (ERS)

Munsell/Salo (ERS)

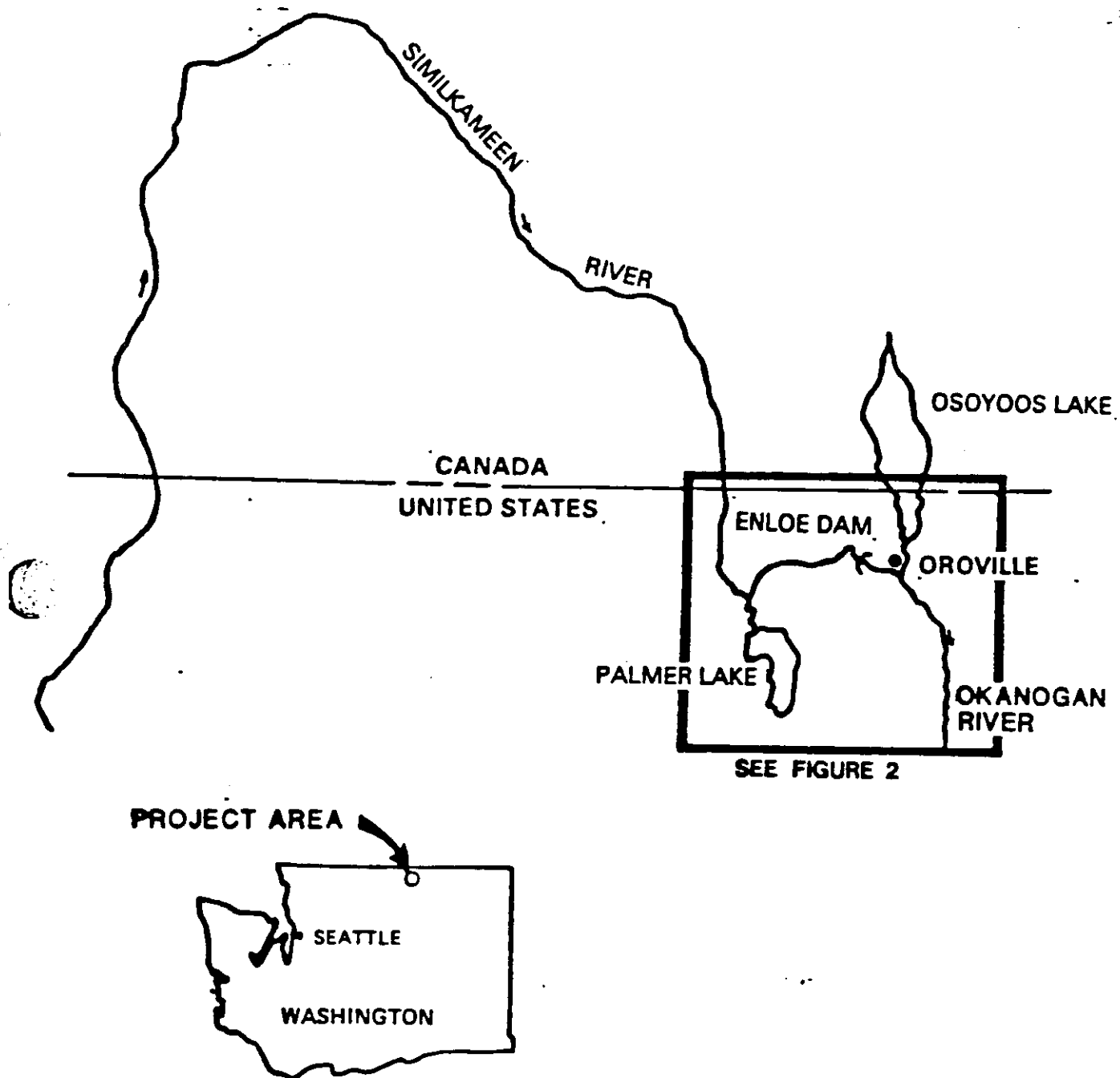
Helms (HH)

ERS Reading File

Gerlach (NPDPL)

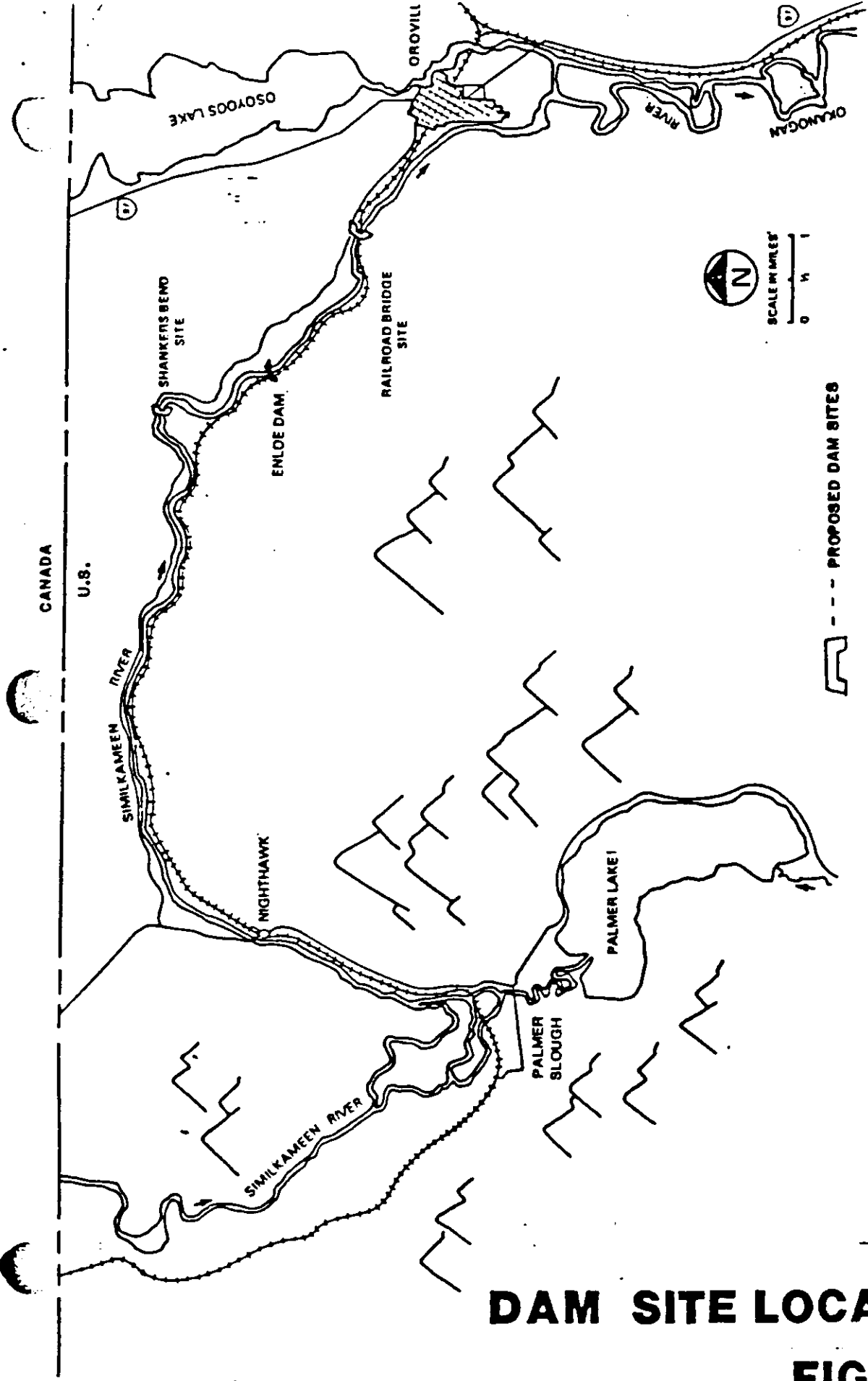
MFR: As indicated in section 1 of this document, the participants and the field agents of the agencies under section 2 will be mailed a copy once it is finalized.

WAKEMAN



**LOCATION MAP**  
**FIGURE 1**





**DAM SITE LOCATIONS**  
**FIGURE 2**



US Army Corps  
of Engineers  
Seattle District

# Schematic Diagram of Pool Elevations and Associated Instream Flow Downstream of Dam: Similkameen River

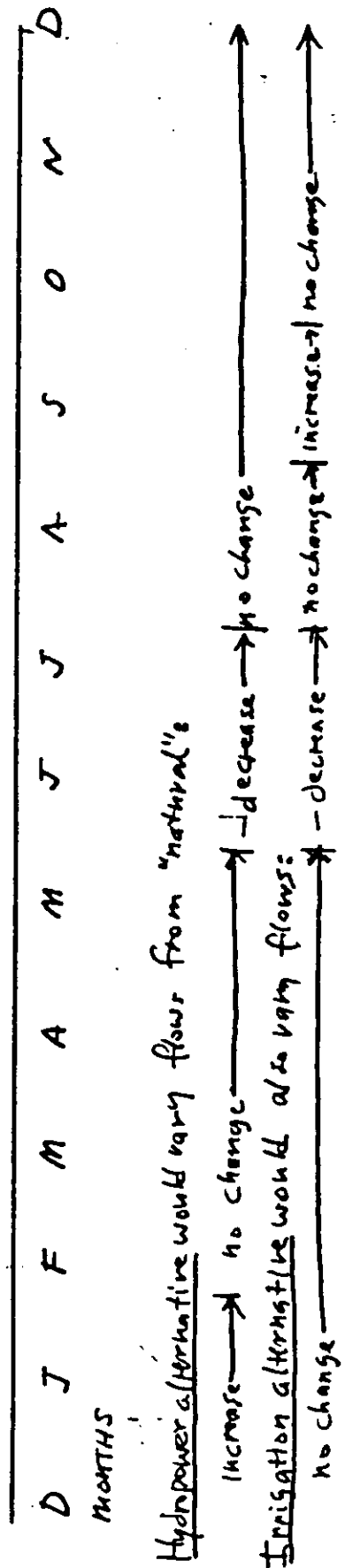
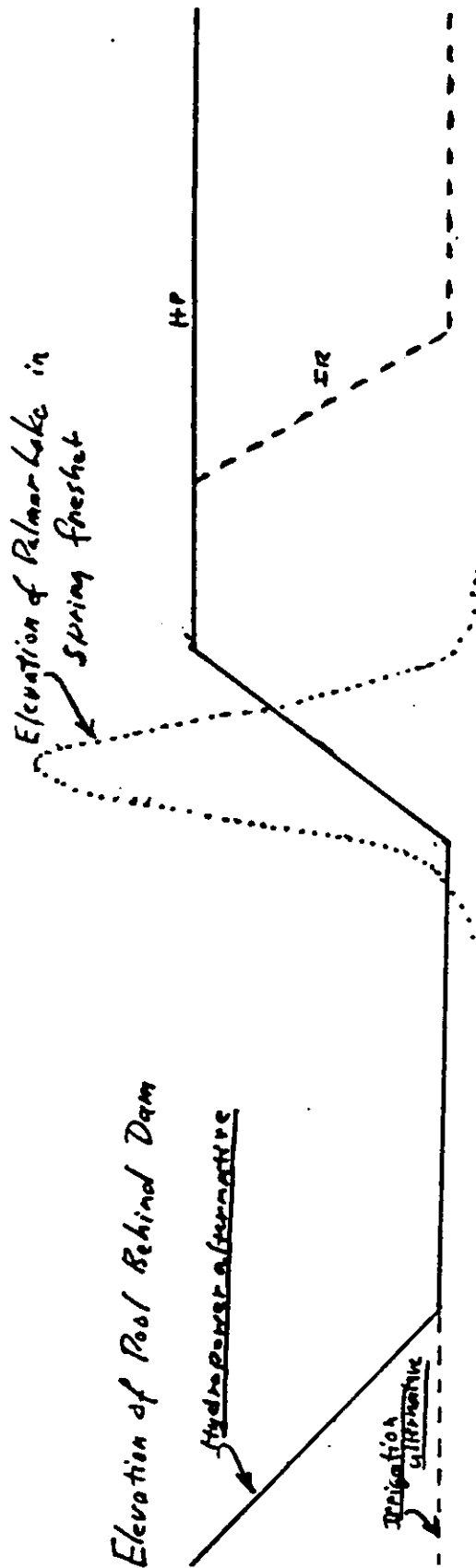


FIGURE 3.

**TABLE 4-3**  
**Mean Length of an Angler Day on the Similkameen River System**  
**as Determined From Completed Fishing Trips**

Month	% Anglers Interviewed with Completed Fishing Trip	Average Length of Angler Day (hrs.)
June	24	1.1
July	28	2.5
Aug.	24	2.2
Sept.	14	0.8

Mr. Felton stated that the Department of Ecology has recommended minimum flow requirements of 40 cfs in the river below the powerhouse.

Mr. Warner indicated that during the 1972 flood event the Similkameen River rose to the base of the Enloe powerhouse windows.

Mr. DeRoberts indicated that a barrier dam at the powerhouse would allow using the tailrace water as part of the attraction flow for steelhead. However, since a 35 foot high structure is required it would be expensive to construct.

Mr. Felton indicated that the Army Corps of Engineers' report might be available this fall. The first cut of their feasibility analysis indicated the Shanker's Bend Dam costs were as high as the larger dam.

Mr. DeRobertis suggested that the Enloe power plant could be rebuilt on the north side of the river using the make up of turbine water for attraction flow.

# MID-COLUMBIA PUBLIC UTILITY DISTRICTS

CHELAN, DOUGLAS, GRANT COUNTIES, WASHINGTON

## REGIONAL COORDINATION OFFICE

April 18, 1985

Mr. Charles T. Collins, Chairman  
Northwest Power Planning Council  
850 S.W. Broadway, Suite 1100  
Portland, Oregon 97205

RECEIVED  
MAY 10 1985  
DEAK CONSULTING

Dear Chairman Collins:

This letter is in response to your five year action plan request for annual reports on Mainstem Passage. We apologize for the delay in this report but much has been in a state of change over the last few months. As will be discussed below, we are continuing to make progress in the FERC proceedings toward resolving issues pertaining to downstream passage.

While we must point out that reporting on activities of FERC licensed projects in relation to the Council's Fish and Wildlife program is the responsibility of FERC, we desire to continue to cooperate with Council to the fullest extent possible. We believe the activities over the last year, along with those outlined for the next several years, are a major achievement since generally they have been agreed to by the fishery agencies and Indian tribes.

The following is a status report indexed to each numbered item found under Section 1504-Action Items of the Fish and Wildlife Program:

### 32. Mainstem Passage - FERC Actions

#### A. General

Since the original five year FERC Settlement Agreement expired in 1984, the involved parties negotiated a new agreement governing spill and bypass planning and testing from 1985 to at least 1987 and, in some cases, beyond. This agreement (copy attached) has been signed by all parties with the exception of the Yakima and Umatilla Indian tribes. The agreement has been filed with the FERC administrative law judge for his approval and, in good faith, the PUDs have begun 1985 implementation of the provisions of the agreement.

It should be noted that the new Settlement Agreement covers only four of the five mid-Columbia projects. The parties were unable to reach a negotiated settlement on Rock Island Dam. Therefore, the issues involved at Rock Island Dam will be resolved in an FERC evidentiary hearing scheduled for June and July, 1985. The development of a complete record of all data and analysis to date will result from this proceeding and will be available to all interested parties by mid-1985. Since the controversy on Rock Island Dam centers around the level of direct project impacts it is not possible to

identify the studies need to accomplish long-term solutions until an FERC ruling is made on direct project impacts. In the interim, Chelan PUD will provide spill as set forth in the FERC order dated November 21, 1984. This order arose out of the prehearing conference held October 30 and 31, 1984 (copy attached).

The PUDs believe the new Settlement Agreement and the FERC order directing spill at Rock Island Dam provide a 1985 program that meets the full intent of the Council Fish and Wildlife Program Section 401 mainstem bypass for the mid-Columbia PUDS.

B. Interim Spill

- o 32.11 Grant County Public Utility District - Priest Rapids and Wanapum Dams

At both Priest Rapids and Wanapum Dams, several years of spill-bypass efficiency data are available. These data indicate that the spill-to-fish passage ratio at Priest Rapids is approximately one to one, varying to some extent depending on migration season timing, diel timing of spill, species mix, and other parameters not well understood.

The spill to fish passage ratio at Wanapum Dam is considerably higher at approximately one to two (spill percent to fish percent). It varies due to the same number of parameters as indicated for Priest Rapids.

Forebay modeling of both Priest Rapids and Wanapum projects (conducted in 1983 and 1984) provided some clear understandings of why these spill vs. fish passage relationships exist. The results of that model testing indicated that the potential for fish guidance to improve spill efficiency exists at Wanapum Dam. However, there appears little potential at Priest Rapids to improve spill efficiency using similar fish guidance measures.

Because of the favorable results of testing and modeling, the 1985 spill program for both Priest Rapids and Wanapum Dam was designed using the spill efficiency data and the assumption that spill efficiency may be improved at Wanapum through fish guidance devices. At Priest Rapids, however, the poor spill-passage ratio and lack of opportunity for significant improvements has led the parties to focus on accelerated design and testing of turbine intake collection systems.

Both Priest Rapids and Wanapum Dams will be monitored hydroacoustically during the 1985 spring migration season.

- o 32.12 Chelan County PUD - Rocky Reach/Rock Island Dams

The 1985 interim spill program for Rock Island Dam is attached as noted above. The basis for the order spill is set forth in the prehearing conference of October 30 and 31, 1984 and subsequent pleadings filed in

the mid-Columbia proceedings. The Council has previously been served in the Chelan's filings concerning this matter.

Chelan PUD will operate the prototype STS, dip gatewells, and provide spill as necessary to achieve a 30 percent bypass level for spring chinook juveniles. Spill up to 10 percent of the daily average flow will be available for 30 days if necessary to achieve the 30 percent bypass efficiency for spring chinook. This level of bypass was selected in recognition of the low spill efficiency and accelerated bypass development at Rocky Reach Dam.

o 32.13 Douglas County PUD - Wells Dam

Spill effectiveness was evaluated at Wells Dam in the spring of 1984. This evaluation indicated very high efficiency in terms of fish passed relative to spill. Based upon this information, a spill program was agreed upon in the 1984 Settlement Stipulation which anticipates continued high passage with limited spill. Spill evaluation will continue at Wells Dam under the terms of the 1984 stipulation.

C. Bypass Planning and Testing

o 32.11 Grant County PUD - Priest Rapids/Wanapum Dams

At Priest Rapids Dam plans and designs are proceeding on schedule to provide a single prototype turbine intake deflection screen for testing during the 1986 migration season. Ongoing cross sectional model tests indicate that the optimum screen will be a nontraveling vertical bar screen. Tests are also proceeding to determine the feasibility of screening from the downstream gatewell instead of the traditional screen location in the upstream gatewell. These tests are scheduled for completion in mid-1985.

Also at Priest Rapids Dam, a transport study was conducted in 1984 which is scheduled for duplication in 1985 and 1986. This study will provide data, based on adult returns, necessary to make decisions on the feasibility of short-haul transport programs in 1988 or beyond. The complete report on the 1984 study is being drafted at Grant PUD and is expected to be circulated in the near future. Preliminary findings of this study have been reviewed by all parties and do show sufficient promise to continue the testing in 1985 and 1986.

At Wanapum Dam, preliminary tests were conducted in 1984 on a 1,400-1,600 ft. long guidance net designed to move fish out of the areas influenced by powerhouse flows and into areas influenced by spill. The preliminary logistics tests indicated that the device could be installed and removed effectively. A complete series of tests measuring guidance efficiency is scheduled for 1985. No designs are being conducted at Wanapum for turbine intake deflection screens based on the assumption that results of the Priest Rapids prototype tests can be

used at Wanapum with the addition of one-year prototype testing directly at Wanapum.

o 32.12 Chelan County PUD - Rocky Reach/Rock Island Dams

At Rock Island Dam the FERC proceedings will determine whether additional studies of bypass systems are appropriate.

Based on past study results, the bypass option selected for development at Rocky Reach Dam is one which consists of turbine intake screening and a juvenile collection system incorporating gatewell orifices and a conduit to transport fish to the Rocky Reach Dam tailrace. This system will be developed, installed, evaluated, and operated according to the work plan found in the 1984 Settlement Stipulation.

o 32.13 Douglas County PUD - Wells Dam

Evaluation of a "baffle-type" spillbay bypass system continued in 1984 with promising results. The work plan found in the 1984 Settlement Stipulation schedules additional installation and testing in 1985, 1986, and 1987. If results continue to indicate success, the complete system could be operational by spring 1988.

D. 32.14 All Mid-Columbia Projects

The annual interim bypass plans and testing of long-term bypass systems is provided in detail in the attached 1984 Settlement Agreement. The stipulation has been developed through coordination with all interested parties.

In addition to the matters discussed above, all five mid-Columbia projects follow adult fishway operating criteria developed through extensive observation and model testing and which were previously approved by the fishery agencies. Additional discussions and consultations are taking place which may form the basis for modification of fishway operating criteria at the projects. Fish counting procedures including seasonality of counting and daily hours of counting and types of measuring devices will be evaluated, and operational criteria will be established in consultation with the fishery agencies and tribes.

Four of the five mid-Columbia projects provide for adult fish counts in a manner acceptable to all involved parties. No adult fish counts are made at Wanapum Dam since there are no spawning areas between Priest Rapids Dam and Rock Island Dam.

In conclusion, the Mid-Columbia PUDs are proud of the spirit, coordination, and cooperation embodied in the 1984 Settlement Agreement and look forward to continued good faith relationships with all involved parties in resolving the downstream passage issue at our five projects.



Mr. Charles T. Collins  
April 18, 1985  
Page 5

The work being done and scheduled by the Mid-Columbia PUDs is intended to meet or exceed both the word and intent of the Council's Fish and Wildlife Program.

If you have any questions or concerns please don't hesitate to contact any of us at any time.

On behalf of the Public Utility Districts  
of Chelan, Douglas, and Grant  
Counties respectfully submitted,

A handwritten signature in cursive script, appearing to read "Al Wright".

Al Wright  
Regional Coordinator

AW:lp:l59R  
Attachments



UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL MARINE FISHERIES SERVICE

ENVIRONMENTAL & TECHNICAL SERVICES DIVISION  
847 NE 19th AVENUE, SUITE 350  
PORTLAND OREGON 97232 2279  
(503) 230 5400

April 24, 1985

F/NWR5

Colonel Roger F. Yankoupe  
District Engineer, Seattle District  
Corps of Engineers  
P.O. Box C-3755  
Seattle, Washington 98124

Re: Similkameen River Hydropower Feasibility Study

Dear Colonel Yankoupe:

On February 26, 1985, members of my staff attended a meeting on the above-referenced study at the Seattle Corps office. Two alternatives were discussed at this meeting: 1) A 230-foot-high dam at river mile 6.6 with a 100,000 acre-foot storage capacity and a maximum pool elevation of 1155 feet; 2) A three-dam alternative involving rehabilitation of the existing facility at the Enloe Dam site, construction of a smaller dam at river mile 6.6, and construction of a third dam above Enloe at Shanker's Bend (RM 10.5). At this time we wish to express our concerns relative to the proposed project and make you aware of important issues that should be considered in future feasibility determinations. Our concerns with the alternatives presented at the meeting relate to conflicts with long-term fishery agency and tribal goals of re-establishing anadromous fish runs in the upper Similkameen River, preservation of habitat now being utilized by anadromous fish in the Similkameen River, and conflicts with energy development priorities established by the Northwest Power Act.

As you are aware, the Northwest Power Planning Council's (NPPC) Columbia Basin Fish and Wildlife Program (FWP) identifies fish passage at Enloe Dam and re-establishment of anadromous fish runs in the Similkameen River as important restoration measures (Section 704(d)). We see several points of conflict between the Corps' hydroelectric development plans on the Similkameen River and the FWP.

First, the alternatives presented at the meeting would involve inundation of a significant amount of potential spawning and rearing habitat above Enloe Dam and some existing spawning and rearing habitat between the proposed dam and Enloe Dam. This is in conflict with Section 1204(a)(1)(D) of the FWP. Second, we believe that fish passage, under the proposed alternatives, is either economically or technically infeasible. Our concerns in this regard center on the difficulties in providing downstream juvenile migrant passage in long, deep reservoirs. Passage success under these conditions is correlated with the length and volume of the reservoir, the relative volume of flow through the reservoir during fish migration, and the physical and biological variables operating within the impoundment. Experience has shown that high dams with large storage capacities on rivers with relatively low discharge preclude successful passage of downstream migrants. This lack of success can usually be attributed to three factors, often acting in concert: 1) Inability



of passage facilities to effectively pass fish. This condition is seen at Cougar reservoir in the Willamette Basin. Improper placement and construction of juvenile collection facilities have been identified as the reasons for failure of the system; 2) Disorientation of juveniles within the reservoir. This appears to be the problem at Round Butte Reservoir on the Deschutes River, and Brownlee Reservoir on the Snake River. In these cases stratification regimes and current patterns in the reservoirs prevent downstream movement of chinook salmon and steelhead, and anadromous fish runs above these dams have been eliminated; 3) delays in out-migration due to increased travel time through the reservoir. This situation is seen at Green Peter Reservoir in the Santiam Drainage. In this case, the facilities appear to be able to effectively pass fall chinook, but the three-week delay incurred by downstream migrants often results in critical passage problems downstream at Willamette Falls. Migration delays have also been noted at Mayfield Reservoir on the Cowlitz River.

As stated above, downstream passage problems at dams appear to be exacerbated by large reservoirs on rivers with relatively low discharge and we are not aware of any comparable reservoir within the Northwest Region where successful downstream fish passage has been achieved. Reservoirs where adequate downstream passage does exist are either basically "run-of-the river" impoundments with relatively large inflow and outflows, or are characterized by the presence of strong anadromous fish runs previous to project construction. In the present case, re-establishment of fish runs to the Similkameen River would require hatchery supplementation for a number of years and it is very doubtful that such a run could survive the impacts on passage imposed by proposed alternatives. It is also doubtful that adequate flows through the reservoir(s) could be maintained to overcome any downstream passage problems inherent in this type of impoundment.

Section 1204(a)(1)(C) of the FWP precludes the Corps of Engineers (among others) from supporting hydroelectric projects that do not provide for "The best available means for aiding downstream and upstream migration of salmon and steelhead." As implied above, the "best available" means for downstream fish passage in these types of reservoirs has proved to be inadequate and, under the proposed alternatives, we do not believe that hydro development on the Similkameen River complies with this section. Should fish passage at the proposed project prove infeasible, development of the project would preclude potential anadromous fish utilization of the upper reaches of the Similkameen River. Under Section 1204(a)(1)(E) of the FWP, this would require compensation for loss of approximately 200 miles of anadromous fish habitat.

Third, Section 1204(a)(1)(G) of the FWP requires that hydro projects do not degrade habitat or reduce numbers of fish. We are concerned that the development alternatives presented will have negative impacts on spawning and rearing habitat downstream from Enloe Dam. At present, a significant number of summer chinook utilize the reach between Enloe and the mouth of the Similkameen for spawning. Potential direct negative impacts from project construction and secondary impacts due to flow alterations should be assessed as part of the feasibility study. Also, the potential impacts from this proposal should be considered in conjunction with impacts arising from

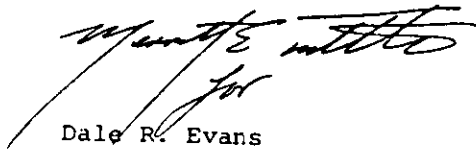
construction and operation of all hydroelectric projects in the Columbia River Basin, as stipulated in Section 1204(B) of the FWP.

Finally, the NPPC's Northwest Conservation and Electric Power Plan adopted in April 1983 predicts that new hydroelectric resources may not be needed until beyond the year 2000 and should energy demand resume, the Northwest Power Act gives priority to conservation measures rather than new development. Hydropower development on the Similkameen River should be evaluated in the context of the need for power. If the purpose of the project is to satisfy local or regional demands, those demands should be documented and the project should be evaluated in the context of local or regional energy alternatives. Also, power acquisition, billing credits, or other assistance for the project by the Bonneville Power Administration will be necessarily conditioned on an evaluation of fishery resource protection, mitigation, and enhancement, as required by the Northwest Power Act.

In summary, we are concerned with losses of existing and potential anadromous fish production in the Similkameen River which could occur as a result of hydropower development. The Columbia River Basin Fish and Wildlife Program and the Regional Energy Plan emphasize the protection and enhancement of anadromous fishery resources as new hydroelectric resources are developed. Therefore, consistency with the Northwest Power Act's mandate for the protection, mitigation, and enhancement of anadromous fishery resources is essential in order to have a feasible project.

Thank you for the opportunity to provide these comments on your hydropower feasibility study. We look forward to reviewing your draft feasibility report. If you have any questions concerning this matter, please refer them to Steve Morris of my staff at (FTS) 429-5430.

Sincerely yours,



Dale R. Evans  
Division Chief

cc: Yakima Indian Nation  
Washington Dept. of Ecology - Jim Bucknell  
Washington Dept. of Fisheries  
Washington Dept. of Game  
Environmental Protection Agency - Carl Kasselbaum  
Fish and Wildlife Service, Olympia - Chuck Dunn  
Bonneville Power Administration - John Palensky  
Colville Tribe  
Columbia River Inter-Tribal Fish Commission  
Columbia Basin Fish & Wildlife Council  
Northwest Power Planning Council



# United States Department of the Interior

BUREAU OF RECLAMATION  
PACIFIC NORTHWEST REGION  
FEDERAL BUILDING & U.S. COURTHOUSE  
BOX 99700 WEST FORT STREET  
BOISE, IDAHO 83720

MAY 30 1985

PN 410

565.

PN 410

APR 28 1985

Reviewed:
Case: <i>Greg [Signature]</i>
No: <i>090</i>

Mr. John Palensky, Director  
Division of Fish and Wildlife  
Bonneville Power Administration  
P.O. Box 3621  
Portland, Oregon 97208

Dear Mr. Palensky:

We appreciated the opportunity to discuss, with Mr. Everson of your staff, the various aspects and status of Bonneville Power Administration's (BPA) implementation of measure 704(e)(1)(A), Enloe Dam Fish Passage, in the Northwest Power Planning Council's Fish and Wildlife Plan.

The Bureau previously indicated to BPA that certain funds were designated for fish passage at Enloe Dam as part of our authorized Oroville-Tonasket Unit of the Chief Joseph Dam Project. \$610,000 are included in the total estimated cost for the fish passage facilities at Enloe Dam. Discussions during the meeting indicated that a plan for fish passage was forthcoming and BPA proposes using Bureau funds in Fiscal Year 1988. We will initiate procedures to include these funds in the budget request for Fiscal Year 1988.

We will coordinate development of an appropriate formal document transferring these funds to BPA as the time for expenditure approaches.

Please contact us if you have any questions.

Sincerely yours,

Assistant  
Regional Director

cc: U.S. Department of Commerce  
National Marine Fisheries Service  
847 NE. 19th Avenue  
Portland, Oregon 97232

Washington Department of Game  
600 North Capital Way  
Olympia, Washington 98504

Project Construction Engineer, Oroville, Washington

## MINUTES OF MEETING

Project 3711.1

Subject: Fisheries Enhancement Plan and Enloe Dam Passage  
Date: 7 May 1985  
Location: Offices of U.S. Bureau of Reclamation (BR), Pacific Northwest Region, Boise, Idaho.

### In Attendance:

<u>Name</u>	<u>Affiliation</u>
Jim Budolphson	Bureau of Reclamation (BR)
Mike Misner	Bureau of Reclamation (BR)
L.B. Everson	Bonneville Power Administration (BPA)
Ron Morinaka	Bonneville Power Administration (BPA)
Len Fanning	IEC BEAK Consultants Ltd. (IECB)

Mr. Everson outlined that the purpose of the meeting was to update the Bureau of Reclamation on the status of the Similkameen River fisheries enhancement plan and Enloe Dam passage project. He indicated that a 3 part draft report presently being prepared by IEC BEAK and OTT Engineers would be distributed for review on 30 June 1985. The final report would be submitted on or before 31 December 1985. At present, BPA has budgetted 4.5 million for final design and construction of passage facilities at Enloe Dam, 2.5 million for FY 1987 and 2.0 million for FY 1988.

Mr. Budolphson indicated that BR funding for Enloe Dam passage beyond FY 1988 needs to be justified and adjusted for the construction schedule. They presently expect approval within a few days for the Wells Hatchery expansion with a 5 year funding cycle. It will probably take until 1 December to finish detailed engineering and tender for construction. Wells Hatchery expansion requirements include a minimum flow of 5 cfs pumped from a 16" well (or 2-8" wells) and 4 adjoining raceways. BR will provide the specifications for expansion to IECO (Engineering Consultants) which they will discuss with Douglas County PUD.

The Bureau of Reclamation will provide a fish transport truck (cost 65K) plus operation and maintenance costs for 5 years. After 5 years ownership goes to Douglas County PUD, in which case the BPA steelhead smolts destined for the Similkameen River could be used somewhere else in the basin. The BR Oroville-Tonasket funding

(1978) included a commitment for Enloe passage (610K in FY 1988), Wells Hatchery expansion (425K in FY 1985) and Wells Hatchery operations and maintenance (125K/year for 5 years).

Mr. Fanning outlined the Canadian federal fisheries manual of compliance testing procedures required to obtain stock certification needed for a permit to transport steelhead smolts across the Canada-U.S. border.

Mr. Budolphson explained that with the Wells Hatchery expansion construction schedule, the first disease compliance testing of adults for certification would occur next winter.

Mr. Budolphson felt that a meeting mid-summer of BR, BPA, IECO, Douglas County PUD and Dave Narver (BCFB) should be organized to review the proposed expansion plans at Wells Hatchery.





APPENDIX 2

Similkameen River System

1984

Summer Creel Survey



**SIMILKAMEEN RIVER SYSTEM  
1984 SUMMER CREEL SURVEY**

Prepared For:

**BONNEVILLE POWER ADMINISTRATION  
DIVISION OF FISH AND WILDLIFE  
1002 N.E. Holladay Street  
Portland, Oregon 97232**

Project No. 83-477

Contract No. DE-AC79-83BP11902

Prepared By:

C.M. Movold and D.G. Hickey

**IEC BEAK CONSULTANTS LTD.  
10751 Shellbridge Way  
Suite 120  
Richmond, British Columbia  
Canada V6X 2W8**

3711.1A

June, 1985



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## 1.0 INTRODUCTION

IEC BEAK Consultants has been engaged by Bonneville Power Administration (BPA) (contract no. DE - AC79 - 83BP11902) who, under the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (the Northwest Power Act) has been given the authority and responsibility to use its legal and financial resources "to protect, mitigate, and enhance fish and wildlife to the extent affected by the development and operation of any hydroelectric project on the Columbia River and its tributaries in a manner consistent with ... the program adopted by the Council ... and the purposes of this Act." The Northwest Power Planning Council (the Council) established under the Northwest Power Act, using recommendations from Federal and State fish and wildlife agencies, the Indian tribes, and other public and private groups developed the Columbia River Basin Fish and Wildlife program (1982) (the Program) for which BPA was empowered to carrying out. Measure 704 (e) (i), Table 5 (A) of this Program recommends the removal or laddering of Enloe Dam, providing access for anadromous salmonids to extensive spawning and rearing habitat in the upper Similkameen River watershed. The first phase of this project was completed in 1984 and was presented in the "1983 Similkameen River Habitat Inventory for Enloe Dam Passage (Project 83 - 477)" report. The "Similkameen River System 1984 Summer Creel Survey" is a component of phase two of the project. The creel survey was conducted to assess the current impact and distribution of angling on resident fish populations as a measure of socioeconomic impacts on the region. The findings of this report will form part of the National Environmental Policy Act (NEPA) baseline assessment document, which will be used to assess the impacts of providing anadromous salmonid passage and the potential impact on resident fish populations. The creel survey was also designed to provide valuable information necessary to the future management of the Similkameen River system fish populations.

## 2.0 DESCRIPTION OF CREEL SURVEY STUDY AREA

The Similkameen River drains about 9300 square kilometres (3620 square miles) of the Pacific Northwest with approximately 82 percent of the total drainage area in British Columbia, Canada. From its origin near the international boundary in Manning Provincial Park, the river flows north to Princeton, B.C. where it is joined by its largest tributary, the Tulameen River. These two streams, both with their headwaters in the Cascade Mountains, generate most of the basin's runoff. The Pasayten River converges with the Similkameen River just upstream of Similkameen Falls. Summers Creek flows into Allison Creek north of Princeton. Allison Creek then flows south-eastward and joins the Similkameen River 3 kilometres downstream of Princeton. Flowing southeasterly from Princeton, the Similkameen River is joined by the Ashnola River near Keremeos, B.C. From here, the river valley widens and the Similkameen River meanders in a southerly trend, crossing the international boundary near Nighthawk, Washington. South of the border, the river flows east towards its confluence with the Okanogan River near Oroville, Washington. A further 120 kilometres (74 miles) downstream, the Okanogan River empties into the Columbia River at Brewster, Washington. The Columbia River then flows about 825 kilometres (516 miles) over 9 dams to the Pacific Ocean. Figure 2-1 locates the Similkameen River system within the Columbia River Basin.

The Enloe Dam, which is located on the Similkameen River about 14 kilometres (8.8 miles) upstream from its mouth, represents the downstream boundary of the study area. Figures 2-2a to 2-2d show the study area, including its major towns and highways.



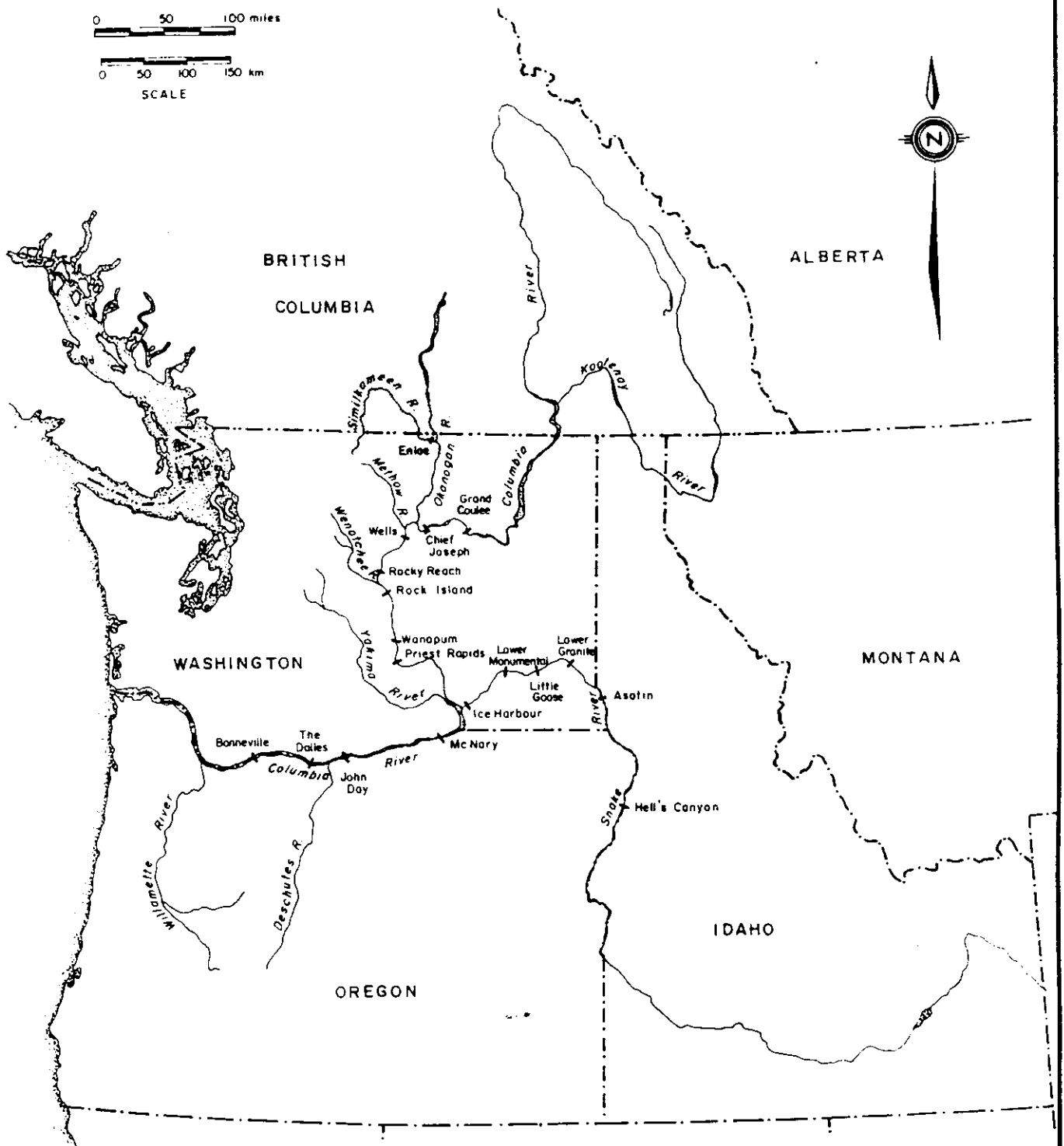


FIGURE 2-1 : Location of the Similkameen River System Within the Columbia River Basin.

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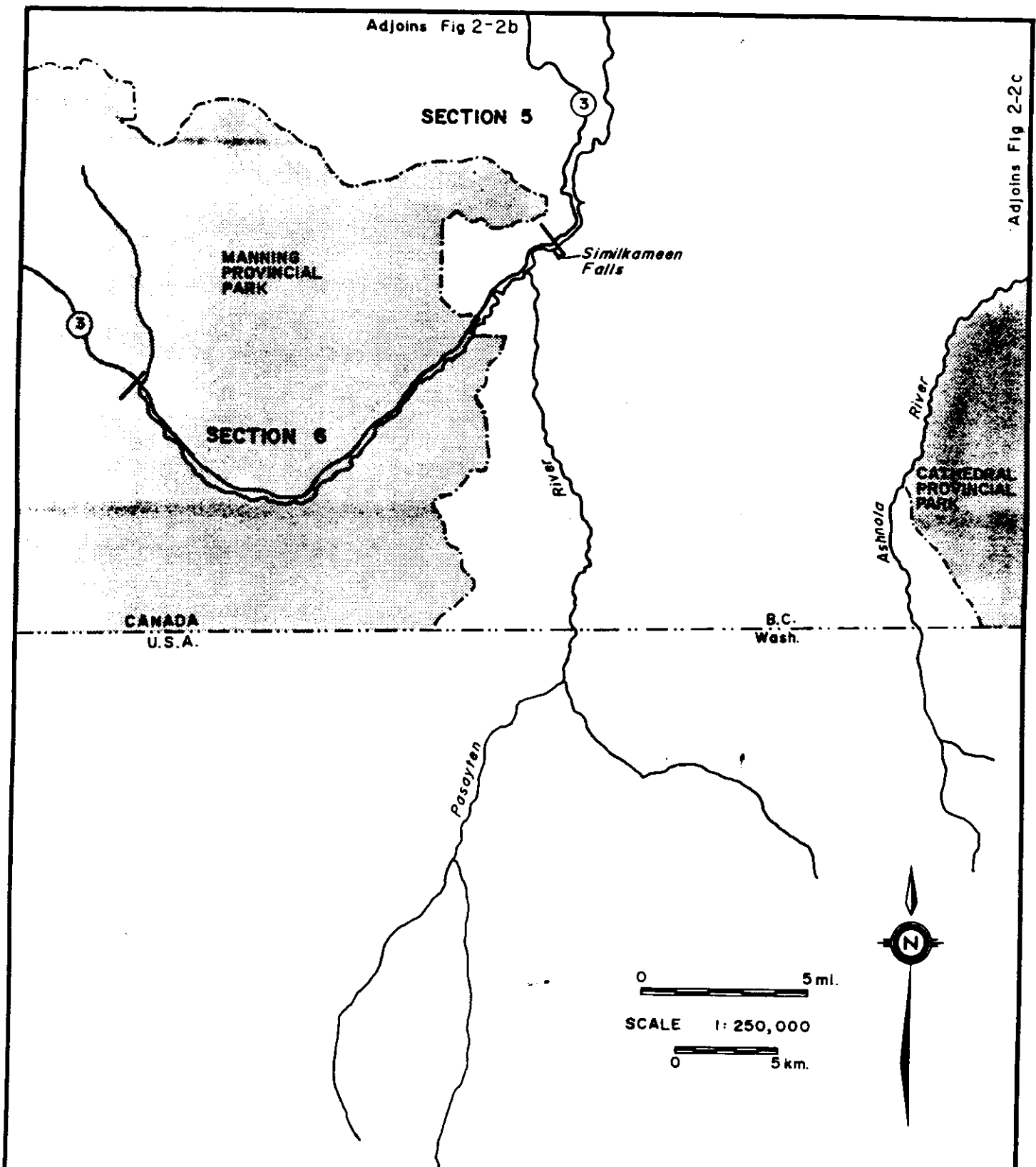


FIGURE 2-2a : Study Area.

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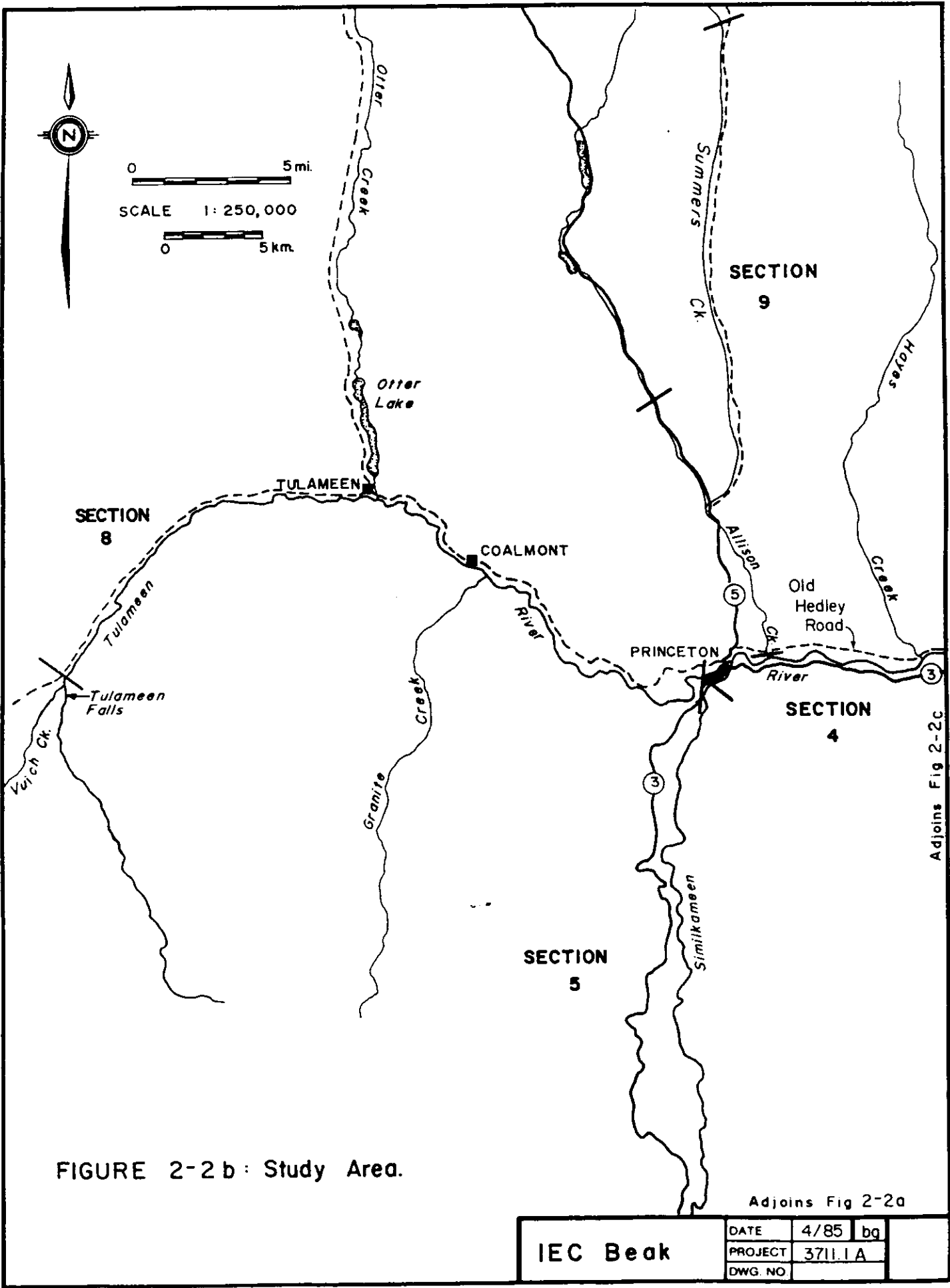
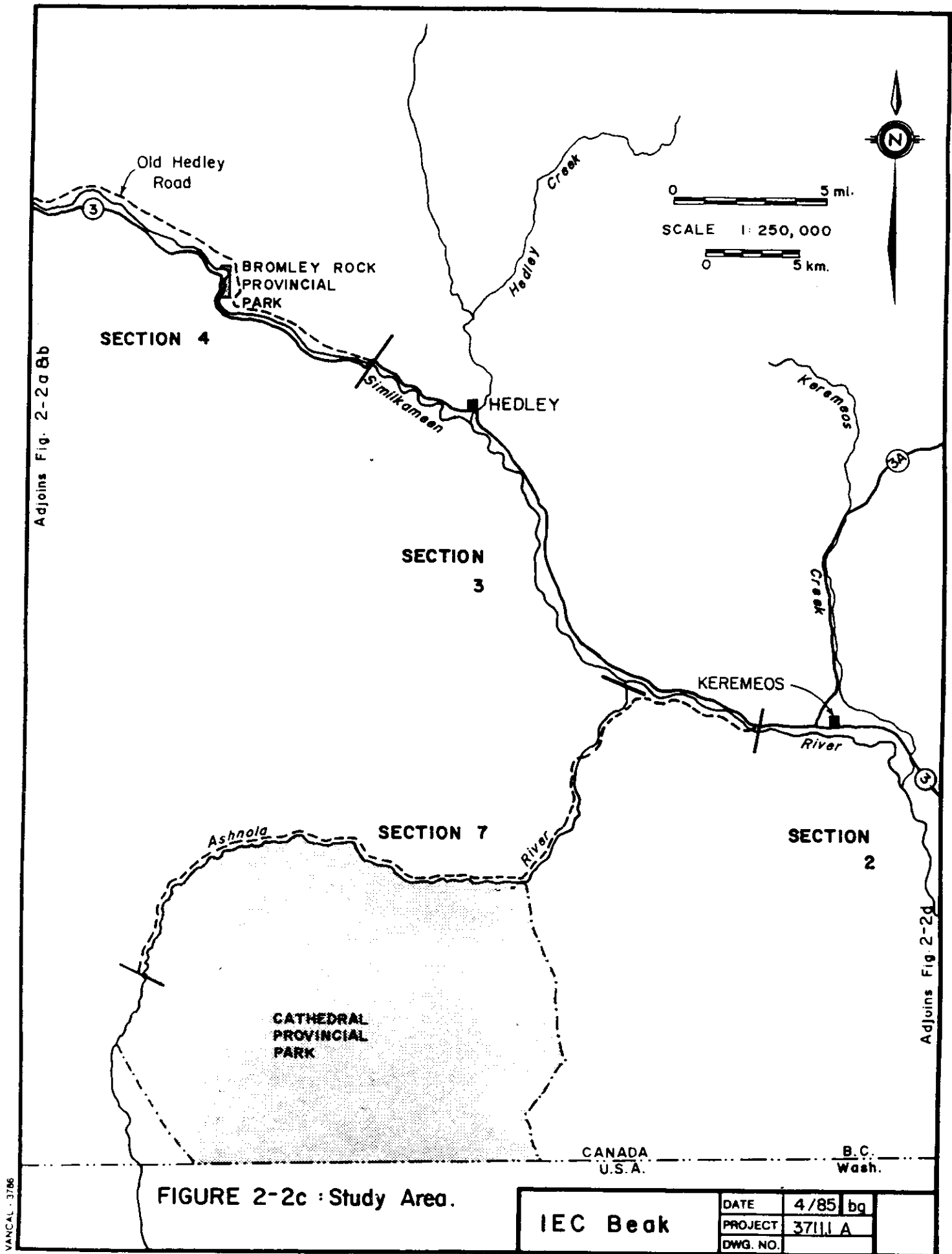


FIGURE 2-2 b : Study Area.

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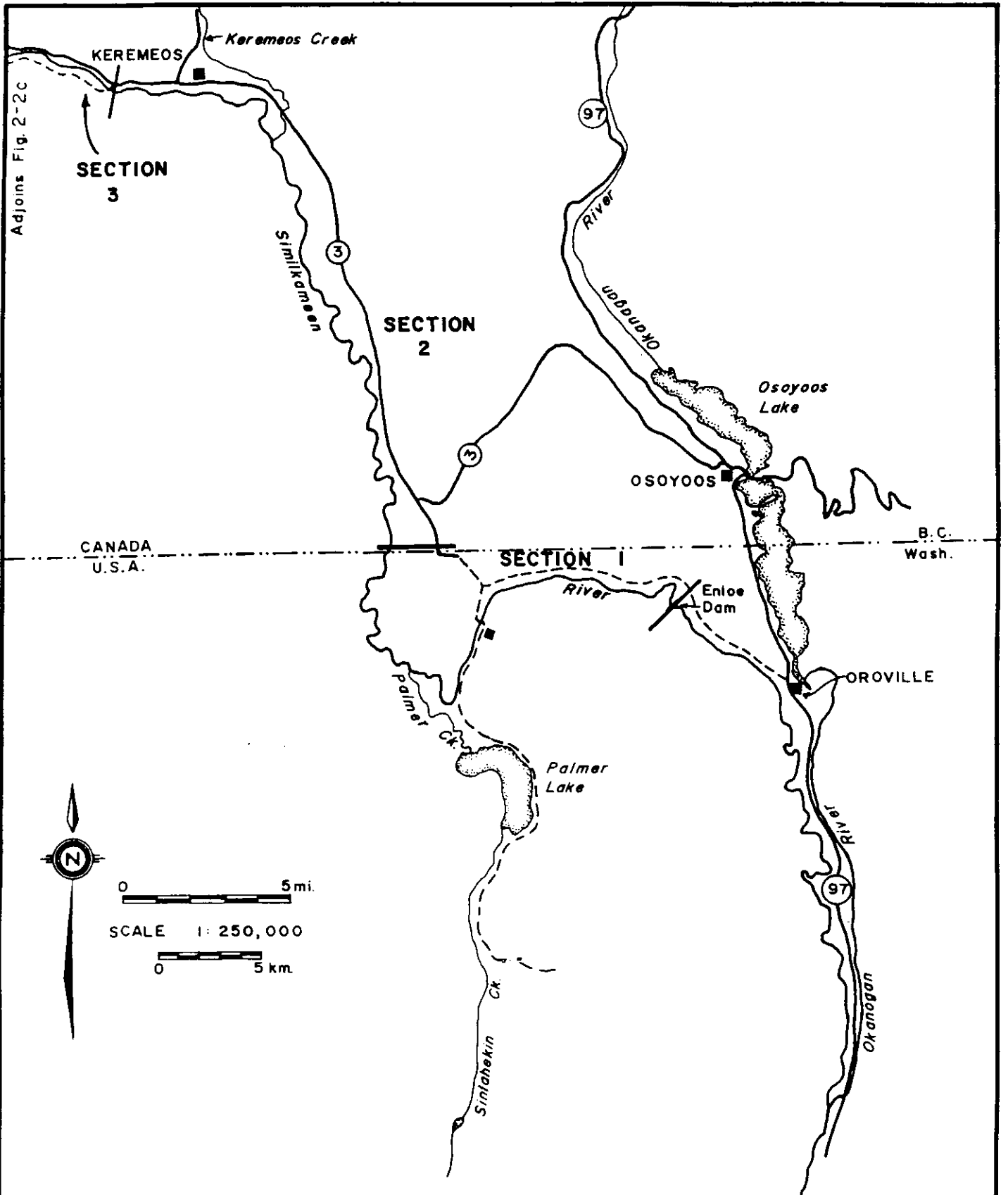


FIGURE 2-2d: Study Area.

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### 3.0 METHODS

#### 3.1 Creel Survey Design

The 1984 Similkameen River system roving creel survey (June 23 - September 8, 1984) was conducted primarily using the methodology described by Malvestuto et. al. (1978). This method of non-uniform probability sampling was used due to the large size of the Similkameen River study area and the transitory behaviour of fishermen in the region. The method is also employed by the British Columbia Fisheries Branch.

The Similkameen River system was divided into nine sampling sections (See Figures 2-2a to 2-2d). The length of each section being determined by the distance the creel clerk could travel within a one hour time period and count all the fishermen present (instantaneous count) in that area. The nine sections sampled totaled approximately 240 miles (400 kilometres) of river. The sampling sections were as follows:

1. Enloe Dam to the U.S.-Canadian border.
2. The U.S.-Canadian border to Keremeos, B.C.
3. Keremeos to the old Hedley Road bridge (junction of Highway 3 and Old Hedley Road).
4. Old Hedley Road bridge to Princeton, B.C.
5. Princeton to Similkameen Falls.
6. Similkameen Falls to the headwaters of the Similkameen River.
7. The Ashnola River.
8. The Tulameen River
9. Summers and Allison creeks.

The Pasayten River was not included in the creel survey because of poor public access and low fishing pressure (Bull, pers. comm., 1984).

Also, consistent with the sampling methodology, each sampling day was divided into two periods, AM (0700-1300 hrs DST) and PM (1300-1900 hrs DST).

A number of sampling design considerations were incorporated prior to the commencement of the field program. Firstly, a probability value of finding fishermen within a certain sampling section was assigned to each section. For example, section six, Similkameen Falls to the headwaters of the Similkameen River, was assigned a probability of 0.20 because a fifth of all fishermen expected to be fishing in the Similkameen River system at one particular time were expected to be within section six. This was done similarly for all the remaining sections (Table 3-1).

Secondly, each sampling day was divided into two periods, AM (0700-1300 hrs DST) and PM (1300-1900 hrs DST) and assigned a probability value of finding anglers during each time period. A probability of 0.40 was assigned to the AM period and 0.60 to the PM period. This meant that 40% of the anglers fishing during the day were expected in the AM period and the remaining 60% in the PM period.

These two probabilities, river section probability and time period probability, were then multiplied to provide a total sampling probability (Table 3-1) of finding a fisherman anywhere in the system at any one time.

Sampling units were then randomly chosen on the basis of the assigned sampling probabilities. This gave a specific sampling section to be surveyed during a specific time period based on the combined probability. Thus, the probability that sampling would actually occur in any given sampling unit was proportional to the amount of fishing occurring in that unit. During the first four weeks of the creel survey (June 23 - July 15, 1984), every day was sampled. However, it was found that the angling effort wasn't sufficient enough to warrant the extensive seven day a week sampling. Since so few fishermen were found to be fishing during the weekdays, the number of sampling days was decreased from five to three days. The three days were randomly chosen for each week and then two sampling units were chosen for each day using the above described method. Due to the greater fishing pressure on weekends, every day was sampled. Sampling units for weekends were chosen independently of those for weekdays. Holidays were considered as weekend days.

A total of 8 days were sampled in June (3 weekends and 5 weekdays), 27 days in July (10 weekends and 17 weekdays) and 21 days in August (9 weekends and 12 weekdays). Only 6 days were sampled in September, 3 weekend day and 3 weekdays.

Following the sampling schedule that was drafted (Table 3-2), each of the two creel clerks, on the designated days, would conduct the creel survey within the selected sampling units. This would include an instantaneous count of fishermen at the chosen time and interviews of fishermen within that unit. The interviews consisted of a questionnaire that was administered by the creel clerks (Appendix 1). Information collected on the questionnaire combined with the instantaneous counts was used to determine catch per unit effort and harvest. Other information collected on the questionnaire included number of anglers, their place of residence, whether they had made a specific trip to the river system just to fish, what species of fish they were fishing for and what numbers and species of fish they were catching and harvesting. Fork lengths (to the nearest millimetre) and weights (to the nearest gram) of the fish caught and retained were recorded when possible. Scales were also taken from these fish for age determination. The fishermen were also asked questions pertaining to their feelings about steelhead trout introduction into the Similkameen River system.

Aerial counts were conducted throughout the survey period using a Cessna 172. Usually two flights per week were made, once on a weekday and once on the weekend. The flights consisted of flying over the two sample units being surveyed that day and counting all the fishermen (instantaneous count). This was done to validate the ground counts. Also, twice a month, once during the week and once on a weekend, full system counts were conducted. This included flying over the two sampling units being surveyed that day by the creel clerks as well as all the other sample sections. These counts were used to verify the estimated proportions of fishing in each section. The flights were scheduled so that as many of the sampling units as possible were flown during the creel survey period.

### **3.2 Data Analysis**

The data collected during the 1984 Similkameen River system creel survey was compiled utilizing the Condor data base program on a Hewlett-Packard 150 (HP-150) micro-computer. This program was used to determine the total number of anglers fishing for each species of fish (rainbow trout, brook trout and whitefish) each month, as well as each anglers' residency. The anglers' residency was divided into four groups;



local (living within a 10 km radius of the river system), a resident of B.C., a resident outside of B.C. but within Canada, or a resident outside of Canada. The purpose of the trip by each angler to the river system, whether primarily to fish or for other reasons, was also determined for each month along with the type of fishing gear used and the number of each species of fish caught and harvested. The anglers' answers to the questions concerning steelhead trout introduction were also tabulated.

In accordance with Malvestuto et al.'s (1978) method for the roving creel survey, the basic equations outlined in this report (Table 3-3), with some modifications, were used to determine angler effort (E), catch (C), harvest (H), catch per unit effort (CPUE) and harvest per unit effort (HPUE). Harvest and HPUE were not calculated by Malvestuto et al., however these values were calculated for this report in the same manner as catch and CPUE but using the actual number of fish harvested.

The above mentioned values were calculated for the entire Similkameen River system and then each individual sample section, on a monthly basis. Calculations for each section were done by deleting the section probability when calculating effort (E).

The major modification to the equations was concerned with accurately reflecting the sampling methodology used, such as the sampling of two sections per day. Malvestuto et al.'s method incorporated only one sample section per sampling day. Since the samples per day were doubled,  $n_h$  (number of days sampled within the stratum), was doubled in the equations. Also N (Table 3-3) was doubled when calculating the variance of  $y_d$  because  $n_h$  had been doubled.

In some cases, the equations were further modified to better depict the angling situation occurring in the Similkameen River system. The equation for determining mean daily CPUE and HPUE for weekends and weekdays was altered slightly by dividing the sum of the CPUE (HPUE) for each sampled weekend day or weekday in the month by the number of days sampled when actual fishing effort occurred. The days when nobody was found to be fishing were excluded from the calculation. Since no fishermen were found to be fishing, CPUE and HPUE were actually nonexistent not zero. Days when fishermen were present but hadn't caught any fish (CPUE equalled zero for the day) were included in the equation. This method most accurately reflected the actual CPUE and HPUE for each month.

The equations for the calculation of all the values (C, H, E, CPUE and HPUE) for the month of June were revised to account for the fact that fishing pressure only occurred in the last eight days of the month. This was due to the high water conditions in the river system throughout the month of June. The last eight days of the month were therefore, the only days suitable for angling and the only days sampled. The equations were adjusted to take this into account with N (total number of days within the month) changed from thirty days to eight days and  $N_h$  (total number of days within the stratum) changed from nine days to three days for weekends and twenty-one days to five days for weekdays.

The sampling probabilities associated with a particular section of the river system used to calculate the total effort expended on the day were different than those sample section probability values used to design the sampling schedule. The latter probabilities were estimated from information provided by B.C. Fish and Wildlife (Matthews, pers. comm., 1984) and the previous summer's (1983) field work. No previous work has been done on the distribution of anglers and angling effort on the Similkameen River system. These probabilities, however, were found to inaccurately portray the actual distribution of anglers on the Similkameen River system throughout the sampling period (June to September). For the calculations of effort (E), these probabilities were changed (Table 3-4). The changes in probabilities were based on the actual aerial and ground counts conducted during the creel survey. These counts reflected a change in angler distribution on a monthly basis.

Scales collected from caught rainbow trout, brook trout and whitefish were aged and their fork lengths back calculated.

## 4.0 RESULTS AND DISCUSSION

### 4.1 Angler Residency and Trip Purpose

A total of three hundred and thirty-six (336) anglers were interviewed between June 23 and September 8, 1984 during the creel survey of the Similkameen River system. The majority of these anglers were not local residents (Table 4-1).

Only 53 (16%) of the anglers interviewed were local residents. Local residents probably preferred fishing the numerous lakes in the area, many of which are stocked, rather than the streams. The remaining 283 anglers had travelled from outside the Similkameen River region to fish of which 239 anglers (71%) were from other parts of British Columbia and 24 (7%) from within Canada. The remaining 20 (6%) were from locations outside Canada. It should also be pointed out that a large number of anglers interviewed on Allison and Summers creeks, although they were residents of the Vancouver area, owned cabins on Missezula Lake, the headwaters of Summers Creek. These anglers were considered as residents of B.C..

Of the 336 anglers, 201 were interviewed on the weekends and only 135 during the week. There was almost an equal number of local residents interviewed during the weekend as during the week (Table 4-1). However, almost twice as many B.C. residents were interviewed on weekends as opposed to weekdays.

Anglers were also asked if the main purpose of their trip was primarily to fish in the Similkameen River system. Table 4-2 shows that a little over 50% (179) of the anglers interviewed had not made a trip to the river system just to fish. This holds true for both weekends and weekdays. However, if these numbers were further broken down, it would be seen that almost 90% of the local residents interviewed made a specific trip to the river system to fish. Of the remaining 283 anglers interviewed (non-local residents), 110 (39%) were there specifically to fish and 173 (61%) were there for other reasons.

When anglers were asked for what other reasons they were there, the most common answer was that they were travelling through the area either on their way to the interior of B.C. or to the coast and had stopped to fish along the river. All anglers interviewed during the creel survey were shore anglers, nobody was seen fishing from a boat. Also, many of the anglers that said they made a trip to the Similkameen River system to fish were also continuing on either to Vancouver (coast) or the interior.

These statements reflect the fact that a major B.C. highway (Highway 3) from the coast to the interior of B.C. runs adjacent to much of the mainstem Similkameen River and thus, the Similkameen River system is easily accessible. Highway 3 is travelled heavily during the summer months as it is a major route to the vacation region of the Okanagan Valley. Traffic along Highway 3 greatly increased on weekends, the majority of traffic heading towards the interior. Since the Okanagan Valley is only a 4-6 hour drive from the city of Vancouver, many residents of the Lower Mainland spend their weekends and vacations in the Okanagan Valley.

Table 4-2 shows a trend that anglers interviewed along the mainstem Similkameen River (above and below Similkameen Falls) where Highway 3 runs adjacent to the river, in the majority of cases had not made a special trip just to fish. However, those anglers interviewed along the tributaries of the Similkameen River where access is not directly off Highway 3 were more inclined to have made a special trip to fish in that area.

#### **4.2 Angler Effort and Distribution of Effort**

Angler effort was calculated on a monthly basis, both for the river system as a whole and then for each individual section. Effort for each individual section was calculated to estimate the contribution of effort by each section to the estimated effort calculated for the entire system. Effort calculated on an individual section basis, when combined, gave a total for the system higher than that calculated for the entire system. This was due to the larger error associated with calculating effort on an individual section basis since less data was used in estimating effort for a single section. Angler effort for each month was initially calculated as total hours fished. By determining the average number of hours per day each angler spent fishing within

each month, an angler day could also be calculated. An angler day being the average length of time an angler fishes per day. Table 4-3 shows the length of an average angler trip on a monthly basis. This was calculated from the average length of each completed angler trip. During June, July and August approximately a quarter of all anglers interviewed had completed their fishing trips. In September, this number was slightly lower.

Angler effort was found to vary considerably between months and also between individual sections. Angler effort was greatest during the month of August with a total of 3,265 ( $\pm 705$ ) angler days (Table 4-4) estimated for the entire system. Almost half of all fishing effort for the season occurred during this month. Also during August, angler effort was concentrated mainly in three areas, the Ashnola River (1292 angler days), Similkameen River above Similkameen Falls (511 angler days) and Similkameen River between Princeton and the Old Hedley Road bridge (497 angler days) (Table 4-5, 4-6 and 4-7). As mentioned in the previous section, this distribution of angler effort is due to summer vacationers travelling Highways 3. Estimated angler effort for June was  $240 \pm 225$  angler days, in July it was  $1,620 \pm 181$  angler days and in September it was  $2,393 \pm 1,799$  angler days. The total effort for the four month period was  $7,518 (\pm 1,122)$  angler days.

Mean daily effort for the river system in June was estimated at 33 hours/day. This increased sharply in July to 131 hours/day and further increased to 232 hours/day in August. In September, the mean daily effort decreased dramatically to 64 hours/day. However, the estimated angler days remained high because hours per angler day was estimated to be less in September than in any other month.

The large concentration of angler effort (42% of the angler days for August) occurred on approximately 40 kilometres of the Ashnola River during August and to a lesser extent (19%) in July (Table 4-5). This was due to the fact that it is a popular recreational camping area. There is a total of six established campgrounds along the Ashnola River itself (four Forest Service and two Provincial). There are also several unestablished areas where people camp. These campsite areas were where the major portion of the fishing effort occurred. Also, many people on their way to hike in Cathedral Provincial Park stopped along the Ashnola River. Mean daily angling effort was estimated at 92 hours/day for August and 33 hours/day for July.

Table 4-2 shows that of the 77 anglers interviewed along the Ashnola River during July and August, 53 had specifically come to fish, the others had come to come to hike, camp and/or picnic.

During June and September, the number of angler days expended were considerably lower than those in July and August. No effort was expended in September and 10% of the angler days estimated for the system during June was expended on the Ashnola River. During June, angler effort was only expended on weekends. The mean daily effort was 20 hours/day (Table 4-5).

A total of 18% ( $1732 \pm 704$  angler days) of the total number of estimated angler days for the Similkameen River system for June to September were expended on the Ashnola River.

The two other areas of angler effort concentration in August, the 30 kilometres of Similkameen River above Similkameen Falls and the 35 kilometres between the town of Princeton and the Old Hedley Road bridge (Table 4-6 and 4-7), had 17% ( $511 \pm 341$  angler days) and 16% ( $497 \pm 217$  angler days) of the August angler effort, respectively.

The section of Similkameen River above Similkameen Falls, runs almost exclusively through Manning Provincial Park. Manning Park is a major camping and picnicing area for summer tourists. Here, fishing pressure was largely situated in the areas where the campgrounds and picnic areas were located. Two major campground areas, Mule Deer with 49 campsites and Coldwater with 63 campsites, are located on the banks of the Similkameen River. Fishing pressure tended to be concentrated in these areas in the early mornings and early and late afternoons. The picnic areas had high concentrations of anglers during late morning and early afternoon as people stopped for lunch and also fished. Areas where Highway 3 closely bordered the Similkameen River were also areas where angler effort was high. There are also two commercial campgrounds just outside the park's boundaries where anglers were noted. Of the estimated angler days for the entire river system during the 1984 angler survey, 18% of the effort was expended in this section. Mean daily effort in June was 7 hours/day increasing to 30 hours/day in July and further increasing in August to 36 hours/day

followed by a decrease to 20 hours/day in September (Table 4-6). During June, 12% of the estimated  $240 \pm 225$  (Table 4-4) angler days for June, was on the Similkameen River above the falls. In July, August and September about a fifth of the fishing pressure each month was on this section of river. Fishing pressure remained fairly high in this section during September probably due to the location of Highway 3 in relation to the river.

Once again, on the Similkameen River between Princeton and the Old Hedley bridge, fishing pressure was concentrated in the areas where there were established picnic and campground sites. Bromley Rock Provincial Park had the largest concentration of anglers along this stretch of river. The picnic area at Bromley Rock was a major stopping off point for travellers on Highway 3. A large pool in the Similkameen River at the foot of Bromley Rock made it a favorite swimming and fishing area. Aside from the provincial campground at Bromley Rock, there are four Forest Service camping areas along the banks of the Similkameen River where anglers were also present.

This section of the Similkameen River sustained 23% of the fishing effort expended on the Similkameen River system during the creel survey (June to September) (Table 4-7). No fishing pressure occurred in this section during June. In August, mean daily fishing pressure was estimated to be 25 hours/day increasing to 35 hours/day in July and 37 hours/day in September.

During July, the Similkameen River between Old Hedley Road bridge and Princeton had 14% of the estimated angler days for the month. This was approximately the same in August and increased to 36% in September.

In the early morning of July 29, a water storage tank on the Newmont Mine property, upstream of Princeton, ruptured spilling approximately 250,000 gallons of water and washing approximately 2,000 yards of mud into the Similkameen River. This caused heavy siltation downstream of the spill site for several days due to the initial spill and subsequent clean up activity at the mine site. No anglers were observed fishing on the river between Princeton and Keremeos during this period. Also, on the night of August 1 and morning of August 2, heavy thundershowers in the Tulameen drainage

caused siltation of the Tulameen River which further added to the turbidity of the Similkameen River between Princeton and Keremeos.

July and August were the only months when fishing was observed on the Tulameen River and the Similkameen River between Keremeos and the Old Hedley Road bridge (Table 4-8 and 4-9).

Estimated angler effort for the Similkameen River between Keremeos and the Old Hedley Road bridge was much the same for July and August, 13 to 14 hours per day for totals ranging from 6% to 8% of the anglers days per month (Table 4-8). The low effort observed on the Similkameen River between the Canada/U.S. border and the Old Hedley Road bridge could be due to the limited accessibility of this portion of the river which flows through private land much of its distance. Approximately two thirds of the river in this section is inaccessible to the general public.

Tulameen River angler effort for August was much the same as that for July, 8% and 9% (Table 4-9) respectively. Mean daily effort was 13 hour/day in July and increased to 20 hours/day in August, for a total of 5% of the angler days estimated for the entire system.

The section of Similkameen River from the Canada/U.S. border to Keremeos only had fishing pressure during August (Table 4-10). The mean daily effort was 14 hours/day for a total of 7% of the angler days for the month and 2% for the season.

The Summers and Allison Creek section had 30% of the total angler days estimated for the system (Table 4-11). In June, angler effort for the entire river system was concentrated on Summers and Allison creeks (78%). In July, the concentration of angler days decreased to 33% and in August angler effort decreased almost to zero. In September, the angler effort increased to almost half (43%) of the effort expended on the river system for that month. Mean daily effort for June was 45 hours/day increasing to 57 hours/day in July.

There was a sharp decline in mean daily effort in August to only 7 hours/day and then it increased again in September to 44 hours/day. Since August was an extremely warm



month, the flow in the upper section, approximately 2 km of Summers Creek, was sub-surface and the level of the entire creek was lower, thereby restricting fishing. This seemed to be the month where fishing pressure shifted from Summers Creek to its headwaters, Missezula Lake. Of the two creeks, fishing pressure was almost entirely concentrated on Summers Creek.

Much of the angler effort on Summers and Allison creeks was targetted on brook trout (Table 4-12). Summers Creek has the largest population of brook trout in the Similkameen River system. Allison Creek and the upper portion of Sinlahekin Creek (in Washington State) contain the only other known populations of brook trout in the system.

No angler effort, during any month, was estimated for the Similkameen River from Enloe Dam to the Canada/U.S. border. However, a considerable amount of dredging occurred. Four dredging operations were seen in this stretch of river. There was also no angler effort on the Similkameen River between Princeton and Similkameen Falls.

Most of the angler effort expended on the Similkameen River system was targetted on rainbow trout. Of the 336 anglers interviewed, almost 80% (226) (Table 4-12) were fishing mainly for rainbow trout. Only at Allison and Summers creeks were anglers targetting another species of fish. Brook trout in Allison and Summers creeks are the major sport fish.

Angler effort throughout June, July, August and September was mainly centered on weekends. During June, mean daily effort on weekends was 75 hours/day and 15 hours/day on weekdays (Table 4-4). Fishing effort was 5 times greater on weekends than on weekdays in the month of June. In July, a mean daily effort of 189 hours/day was expended on weekends and 103 hours/day on weekdays. Almost twice as much effort was expended on weekends than on weekdays. Angler effort in August was only slightly higher on weekends (279 hours/day) than on weekdays (212 hours/day). This was largely due to the fact that August was the month most people were vacationing for extended periods not just a weekend, resulting in angler effort being distributed almost evenly throughout both the weekdays and weekends. Angler effort in September returned to its previous trend of angler effort being concentrated on weekends (105 hours/day vs. 40 hours/day).

### 4.3 Catch and Harvest

During the 1984 Similkameen River system creel survey, the anglers interviewed had caught a total of 631 fish, 229 of these were kept and the rest released (Tables 4-13, 4-14 and 4-15). If the catch and harvest are broken down by species, the catch was 475 rainbow trout (155 kept) (Table 4-13), 10 whitefish (8 kept) (Table 4-14), 138 brook trout (62 kept) (Table 4-15), 1 cutthroat trout (and kept) and 7 squawfish (3 kept).

The estimated catch of all species of fish for the entire river system from June through September was  $10,791 \pm 3,253$  fish (Table 4-16). The estimated harvest was  $4,619 \pm 1,893$  fish. Table 4-17 shows the estimated catch of fish from the Similkameen River system, excluding brook trout, which were only found in Allison and Summers creeks. Excluding brook trout, the estimated catch was  $7,757 \pm 1,399$  fish, the majority of these being rainbow trout. Brook trout made up between 20% and 30% of the catch and harvest in the system.

August, being the month with the highest estimated effort, was also the month with the largest estimated catch ( $6,361 \pm 2,830$ ) and harvest ( $2,567 \pm 2,567$ ) (Table 4-16). The estimated catch for July was  $2,539 \pm 384$  fish. Fifty-one percent of the catch ( $1,312 \pm 290$ ) was harvested. In June, an estimated  $1,68 \pm 512$  fish were caught, of which  $320 \pm 384$  were harvested. An estimated  $1,323 \pm 1,875$  fish were caught during September, of these, 32% ( $420 \pm 574$ ) were harvested. Catch per unit effort (CPUE) (Table 4-18) was 0.8-0.9 fish/hour in July and August. September had the lowest CPUE at 0.4 fish/hour and June had the highest CPUE at 2.2 fish/hour. The high CPUE in June was probably due to the fact that more experienced fishermen were present. They knew from previous experience that fishing success was best as high water receded and they knew areas where catch success was best. Harvest per unit effort (HPUE) was much the same in June and July, 0.5 and 0.6 fish/hour, respectively. HPUE was the same in August and September, 0.2 fish/hour. In June and August, anglers on the Similkameen River system were only keeping approximately a quarter of their catch and in July and September they were keeping roughly half.

Since no angler effort was observed expended on the Similkameen River from Enloe Dam to Keremeos and from Princeton to Similkameen Falls, no fish were estimated to have been caught in these areas.

The largest proportion of fish caught in the Similkameen River system were caught in the Ashnola River (Table 4-19) although, only a quarter of the estimated rainbow trout standing crop for the system (IEC BEAK, 1984) was estimated to be in the Ashnola River. Of the total catch calculated for the system, during June through September, 44% (7,063) was estimated for the Ashnola River as well as 43% (2,405) of the total harvest. August was the month that had the greatest catch of fish. Of the estimated catch for the system in August, 72% of the fish caught were from the Ashnola River. The harvested fish from the river in August accounted for an estimated 66% of the harvest for the system during the month. Also, 85% of all fish caught in the Ashnola River were caught in this month. Only 26% of the fish caught in the Ashnola River during August were kept (Table 4-19). Mean daily CPUE during August was 2.1 fish/hour and mean daily HPUE was only 0.5 fish/hour (Table 4-20).

In July, however, 79% of all fish caught were kept, although the catch was only 22% of the total catch for the system. CPUE was 1.1 fish/hour and HPUE was 1.0 fish/hour. Harvest in June was 94% of the catch. The catch from the Ashnola River during June (15%), as in July, was relatively low compared to the rest of the system. CPUE was 0.9 fish/hour and HPUE was 0.8 fish/hour in June. No fishing pressure was recorded during September for the Ashnola River and therefore, no catch was estimated. CPUE and HPUE were relatively high for the Ashnola River as compared to the rest of the Similkameen River system. Since a large portion of angler effort for the Similkameen River system is concentrated on the Ashnola River, it is not surprising that the catch is also large. However, the effort expended was only 18% of the total effort for the system. The catch in the Ashnola River was 44% and harvest was 43% of all fish caught and kept in the system. It would appear that angler success is high on the Ashnola River, this could be reason for the large amount of angler effort on the river.

The majority of fish caught in the Ashnola River were rainbow trout, with the exception of one cutthroat trout (Table 4-13 and 4-14). All anglers were targetting on rainbow trout (Table 4-12).

Allison and Summers creeks were also areas where angler effort was high (24% of the total effort) as was catch. Of the total catch and harvest of fish from the Similkameen River system, 35% (Table 4-21) were caught in Allison and Summers creeks and 34% harvested.

July and September were the months of highest catch in Allison and Summers creeks. Approximately the same number of fish were caught each month, although July's catch was 51% of the system total and the catch in September was 84% of the total. The CPUE in September was half of that in July (Table 4-22). Almost 80% of the catch for Allison and Summers creeks during the survey were in these two months. Mean daily catch for each month was about 70 fish/day. The remaining 20% of the catch was evenly distributed between June and August, however mean daily catch in June was 77 fish/day which was far greater than the 20 fish/day caught in August. Since so few days in June were actually conducive to fishing due to high water, the number of fish caught throughout the month was low, even though the highest mean daily catch was in June. August had the lowest mean daily catch due to the warm weather and low water levels. Brook trout in streams tend to move to cooler waters (below 20°C) as surface waters warm up (Scott and Crossman, 1973). In the case of Summers Creek, where almost all the brook trout were caught, the fish were caught in the 10 kilometres of stream downstream of Missezula Lake. This section flows through open fields where there is very little shade cover and is therefore subject to warming as well as being fed by the warm lake water. Water temperature data (Environment Canada, 1977) indicate water temperature for Summers Creek at the outlet of Missezula Lake average about 18.5°C in August but at the lower end of Summers Creek near Princeton the average is only 12°C. It would seem that the brook trout move downstream from the top end of Summers, which is easily accessible to anglers (since much of it runs along side the road) to the middlereaches of the stream which runs through fairly dense forest in a steep valley, fed by smaller cooler streams. Since the brook trout had probably moved to areas less accessible to anglers, fewer fish were caught and fewer people expended the effort to catch them. The behaviour of the brook trout also changes with higher water temperatures, they become increasingly cryptic and less active (Cunjak and Green, 1984), also making them harder to catch.

Catch and harvest was calculated separately for rainbow and brook trout (Table 4-23 and 4-24) for Allison and Summers creeks. The total catch (approximately 5,600) for this section of the Similkameen River system was approximately 5% of the rainbow trout (Table 4-23) and 30% of the brook trout (Table 4-24) catch in the entire system. Of the total number of fish caught, 86% were brook trout. A larger proportion of those rainbow trout caught were harvested (56%) (Table 4-23) than brook trout, of which only 30% (Table 4-24) of all brook trout caught were harvested. CPUE's were higher for brook trout (0.3 - 1.4 fish/hour) (Table 4-25) than for rainbow trout (0.1 - 0.3 fish/hour) (Table 4-26). HPUE's for each species were much the same, with rainbow trout HPUE between 0 - 0.3 fish/hour and brook trout between 0.1 - 0.5 fish/hour. Anglers tended to keep the rainbow trout they caught far more frequently than brook trout, except in the month of August where 77% of the brook trout caught were harvested. This could be due to the fact that as more effort had to be expended to catch a single brook trout, the angler tended to keep any brook trout caught.

On the mainstem Similkameen River, the section of river above Similkameen Falls had the greatest catch and harvest (Table 4-27). On the Similkameen River itself, 68% of the fish caught were caught above Similkameen Falls, and 57% of the harvest was in this section. Of the catch for the whole system, 13% of the fish were caught above Similkameen Falls. Of the harvest for the system, Similkameen River above the falls contributed 12%. All fish caught were rainbow trout (Table 4-12 and 4-13). An estimated 14% of the rainbow trout population in the Similkameen River system is in this section (IEC BEAK, 1984).

August was the month in which the highest estimated catch as well as effort was recorded in this section (Table 4-27). Fifty-three percent of the total catch for the section was in this month. Although the catch was only 13% of the total for the system during July, harvest was low in this section. Only 5% of the fish harvested in August, from the Similkameen River system, were from this section. Also, only 11% of the fish caught in this section during August were kept. The harvest in this section was also very low in June and July. In September, all fish caught were kept. On this section of river, particularly, most fish caught were released. There were fairly high CPUE's (0.4 - 1.0 fish/hour) but low HPUE's (0 - 0.4 fish/hour) (Table 4-28). This was

probably due to the small size of fish in this section. Many people released the majority of fish they caught.

In the Similkameen River below Similkameen Falls, where an estimated 54% (IEC BEAK, 1984) of the rainbow trout standing crop for the system was estimated to be present, only 6% (957) of all fish caught in the system were caught there and 88% (840) (Table 4-29) of these, were caught between Old Hedley Road bridge and Princeton. Of the total effort expended on the system, 20% was between Old Hedley Road bridge and Princeton where only 5% of the total catch was. No fish were caught in this section in June or September. In June, no one was fishing due to high water and in September anglers weren't catching any fish even though effort was high (Table 4-7). The catches in July and August were both approximately the same although the effort was 44% higher in August than in July, as well, the catch in July was 10% of that for the system but only 5% in August. In July, 67% of the fish caught were harvested but in August only 21% were harvested. CPUE and HPUE were highest in July (Table 4-30).

On the remainder of the Similkameen River, where effort was expended, all fish caught were kept (Table 4-31 and 4-32). Only 1% of all fish caught were caught in these sections. In the section of Similkameen River from the Canada/U.S. border to Keremeos, an estimated 1% of the fish caught in the system (Table 4-31) were caught and kept in August. This is the only time fishing pressure occurred in the section from Keremeos to Old Hedley Road bridge. Mean daily CPUE and HPUE was estimated to be 0.1 fish/hour (Table 4-33). An estimated 2% of the catch in July was in this section. (Table 4-32). No fish were observed caught in August. In addition, no angler effort was recorded for June and September. CPUE and HPUE in July was 0.3 fish/hour (Table 4-34).

Although 54% of the estimated rainbow trout population of the Similkameen River system was estimated to be in the Similkameen River below Similkameen Falls, relatively few fish were caught in this section. The section of river between Princeton and the Old Hedley Road bridge which flows closely to the highway had the highest catches. Between Similkameen Falls and Princeton, the river flows away from the highway through largely inaccessible terrain including the Newmont Mines

property which is closed to the public. As discussed previously, the section of Similkameen River downstream of the Old Hedley Road bridge to the Canada/U.S. border flows through orchards and fields all of which is private and inaccessible by the general public. The Similkameen River downstream of the border to Enloe Dam once again flows through large areas of private land but can be easily accessed in certain areas. There wasn't any fishing effort observed, however, probably due to the fact that very few tourists travel the highway along this portion of the river. The highway tends to be narrow and winding, used mainly by local traffic.

The Tulameen River had an estimated 2% of the catch for the entire system (Table 4-35) for the season. Harvest was estimated at 3% for the season. The catch for this section was split evenly between July and August. No effort was observed on the river during June and September. CPUE's for the two months ranged from 0.3 - 0.5 fish/hour and HPUE ranged from 0 - 0.2 fish/hour (Table 4-36).

Of the total effort expended for the system, 7% was on the Tulameen River (Table 4-9) for 2% of the catch. The relatively small amount of effort and capture on the Tulameen River could be due to fact that large portions of the Tulameen River are inaccessible to the casual angler because of steep cliffs and private property.

All anglers interviewed were fishing mainly for rainbow trout (Table 4-12). The majority of fish caught were also rainbow trout (Table 4-13) with the exception of one whitefish (Table 4-14).

#### **4.4 Angling Method and Success**

The majority of anglers interviewed during the creel survey were using bait as a method of catching fish (Table 4-37). Of the 336 anglers interviewed, 170 (51%) were using bait, 105 (31%) were using flies and 61 (18%) were using lures. Table 4-38 shows the number of each species of fish caught by each angling method. The method that caught the most fish was bait, a total of 279 (44%) fish were caught. Using flies anglers caught 191 (30%) fish and using lures 161 (26%) fish were caught. Of the 475 rainbow trout caught, 175 (37%) were caught on bait, 151 (32%) using lures and 149 (31%) on flies. Of the 138 brook trout caught, 98 (71%) were caught using bait, 36

(26%) on flies and 4 (3%) using lures. Over half (60%) of the 10 whitefish caught were caught using flies. The remaining 4 (40%) were caught using bait. The one cutthroat caught was caught using bait. All squawfish were caught using lures.

The success of each method used varied from month to month (Table 4-39). In June, flies and bait were the two most successful methods of angling being used. In July, flies and bait were almost equally successful. The range was 1.4 to 1.9 fish/angler. Lures were not very successful during June and July (0-0.4 fish/angler). In August and September, however, lures were more successful than the other two methods of angling (Table 4-39). The success of bait remained fairly high throughout the creel survey.

#### **4.5 Length, Weight and Age of Catch**

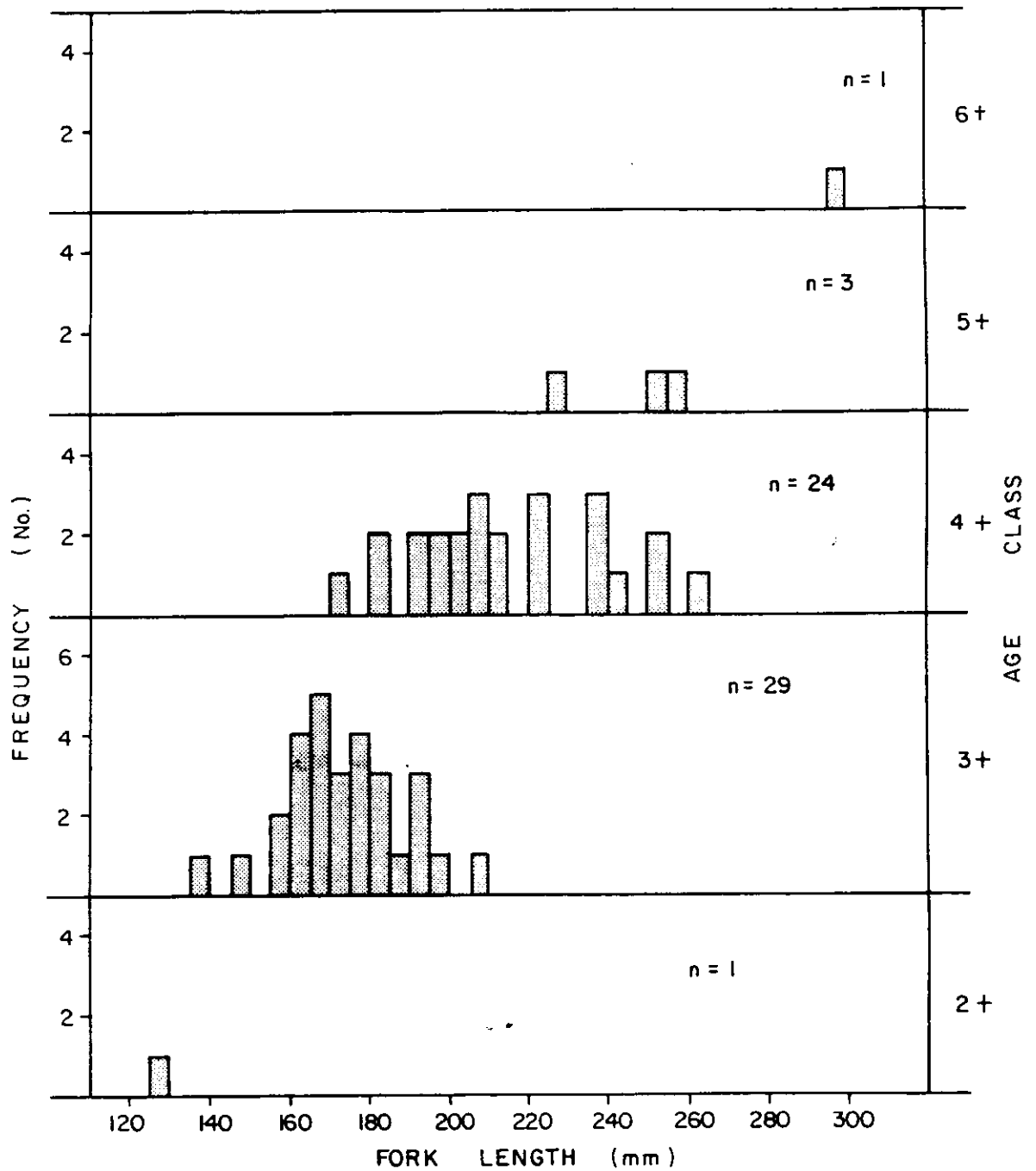
Of the rainbow trout caught and kept from the Similkameen River system, the average fork length and weight was  $196.7 \pm 32.4$  (S.D) (n=77) millimetres (mm) and  $77.5 \pm 34.5$  (S.D) (n=48) grams (g). The largest rainbow trout was 300 mm and the smallest was 130 mm (Table 4-40). The ages ranged from 2+ to 6+, with 50% of the fish being 3+ and 41%, 4+ (Table 4-40).

Table 4-40 summarizes the mean fork lengths and weights for the age classes of rainbow trout harvested. The mean fork lengths and weights were also within the ranges of those determined by IEC BEAK (1984) for the various age classes within the Similkameen River system.

Figure 4-1 depicts the length frequencies within the various age classes of rainbow trout examined.

Several of the rainbow trout sampled showed good growth more typical of a lake environment (Appendix 2). This was based on scale clarity and position of annuli. Of the 11 rainbow trout that showed this growth, 4 were caught in the Similkameen River above Similkameen Falls. These fish probably came out of the Lightning Lakes chain via Muddy Creek and into the Similkameen River. The rainbow trout were caught downstream of the Muddy Creek confluence. From the Ashnola River, 5 rainbow trout





**FIGURE 4-1 : Length - Frequencies by Age Class for Rainbow Trout in the Similkameen River System.**

were caught showing the good growth pattern. These trout were probably originally from Ladyslipper Lake, which is stocked with rainbow trout by B.C. Fish and Wildlife (Matthews, pers comm., 1985). They would have entered the Ashnola River via Lakeview Creek. A single rainbow trout caught in Summers Creek also showed typical lake growth. This fish probably came downstream from Missezula Lake, which in the past has also been stocked with rainbow trout. Also, one fish was caught in the Similkameen River between Old Hedley Road bridge and Princeton, with scales suggesting lake growth. This rainbow trout may have originated in Wolfe Lake.

Of the five brook trout from Summers Creek whose scales could be read, 4 were age 2+ and one was age 3+ (Table 4-41). The mean fork length was 181.0 mm for age 2+ and the age 3+ was 198.0 mm. Scott and Crossman (1973) state that large numbers of small brook trout (less than 254 mm) may overpopulate small streams and this seems to be the case in Summers Creek.

Whitefish scales were difficult to read due to numerous checks in the annuli. Therefore, the ages shown in Appendix 2 are estimates with the best estimate given first. Two of the whitefish were estimated at age 4+ with an average fork length of 289.5 mm and two were estimated at age 5+ with a mean fork length of 325.0 mm.

#### **4.6 Opinions on Steelhead Trout Introduction**

During the 1984 Similkameen River system angler survey, anglers were asked questions concerning steelhead trout introduction into the river system. To the question of whether or not they favoured steelhead trout introduction, an overwhelming number of anglers (Table 4-43) were in favour of it. Of the 336 anglers interviewed, 294 (88%) were in favour of it, 9% (31) were undecided and only 3% (11) were against steelhead introduction. Of the 11 people who weren't in favour of steelhead trout introduction, 5 people liked the river the way it was and felt there were other streams in the province for steelhead trout fishing. They also felt too many people would come to fish. Two people felt too many fishing restrictions would be imposed on the river system and the remaining 4 people were fishing on Summers Creek and were opposed to steelhead trout introduction because they felt it would

affect the brook trout population. Many of the anglers interviewed on Summers and Allison creeks who favoured steelhead trout introduction expressed concern that it might effect the brook trout population. These people were in favour of steelhead trout but only if the fish didn't have a major impact on the brook trout in the creeks.

The 88% of the anglers that were in favour of steelhead trout introduction were so for many different reasons including better fishing, more steelhead in the province and increased tourism to the area. Several people also felt if steelhead trout were introduced, new fishing regulations should be put in place along with better enforcement of the regulations. Some regulation changes suggested included a size limit for trout kept. At present, there is no size restriction on the trout harvested. If steelhead trout were introduced into the system, at least a 20 cm size limit would probably be introduced (C. Bull, pers. comm., 1985) in keeping with the coastal size limits for trout in streams where steelhead are present. Over 57% (44 out of 77) of the measured rainbow trout kept by fishermen during the creel survey were under 20 cm. If this regulation was instituted, it would also significantly curtail the harvest of the wild rainbow trout as well as protect steelhead trout smolts.

Several anglers also expressed concern about the impact of steelhead trout on the existing resident rainbow trout population.

Anglers were also asked if they would make a special trip to the Similkameen River system to fish for steelhead trout (Table 4-44). Of the 336 anglers, 164 (49%) that said they would, 161 (48%) said no and 11 (3%) were undecided (Table 4-44). Of the 164 that said they would, 46% (76) would spend atleast a weekend fishing, 16% would spend a week or more fishing and the remaining anglers would spend a day or less.

Those anglers who said they would not make a special trip to the Similkameen River system to fish for steelhead were then asked whether they would spend more time fishing on a trip if they knew steelhead trout were in the system. Specifically, if they were passing through the area, would they expend more angling effort if steelhead trout were in the system. Table 4-45 shows the responses of the 172 anglers that said they wouldn't make a special trip. Forty-two percent said they would spend more time fishing. The majority (78%) of these anglers would spend a couple of hours, up to a

day fishing. Of the 336 anglers interviewed, almost 30% (99) felt that steelhead trout in the system would not affect their angling effort. However, 70% of the anglers would make a special trip or expend a little more effort fishing.

## 5.0 SUMMARY

1. This report presents the results of a roving creel survey conducted within the Similkameen River basin between June 23 and September 8, 1984. The main study objectives were to:
  - i) estimate the angler effort expended and its distribution in the system during this period;
  - ii) estimate the catch and harvest per unit effort;
  - iii) estimate the angler catch and harvest by species;
  - iv) collect biological data on the fish harvested;
  - v) determine angler residency, trip purpose and trip length; and
  - vi) solicit opinions and concerns on the introduction of steelhead trout into the Similkameen River system above Enloe Dam.
2. The survey was designed primarily using non-uniform probability sampling techniques due to the large size of the study area and the transitory behaviour of the fishermen. Each sampling day was divided into two periods, AM and PM. In addition, two probability values were assigned for finding fishermen, first, within a certain sampling section and second, within an AM or PM time period. These values were multiplied to provide a total probability of finding a fisherman anywhere in the system at any one time. Sampling units were then randomly chosen on the basis of the assigned sampling probabilities. Therefore, the probability that sampling would actually occur in any given sampling unit was proportional to the amount of fishing occurring in that unit. Sampling units for weekends were chosen independently of those for weekdays. Holidays were considered as weekend days. Sampling was conducted in two units per day on those weekdays and all weekend days.

3. Two creel clerks surveyed approximately 400 kilometres (240 miles) of stream divided into nine sampling sections. Six sections were delineated on the Similkameen River mainstem, one each on the Ashnola and Tulameen rivers and one encompassing both Summers and Allison creeks downstream of man-made fish barriers. The length of each section was determined by the distance that the survey clerk could travel within a one hour time period and count all the fishermen present in that area. Angler interviews were conducted with as many anglers as possible during the one hour period. Instantaneous aerial counts were also conducted over these sections with the exception of the Ashnola River due to its steep, narrow and forested valley bottom.
4. A total of 336 anglers were interviewed during the angler survey. Only 16% of the anglers interviewed were local residents. Of the remaining anglers, 71% were from other parts of British Columbia (mainly the Lower Fraser Valley), 7% from outside of the province and 6% from outside Canada. The local residents prefer to fish the area's lakes, many of which are stocked.
5. Nearly 90% of the local residents interviewed had specifically come to the river to fish. In contrast, only 39% of the non-resident anglers had made the trip just to fish. This reflects the transient nature of the visitors to the Similkameen area who are most often only travelling through on their way to either the coast or the interior of the province. The close proximity of a major highway to a considerable length of the Similkameen River allows travellers to stop and fish during their stops in the area. This was not the case in the less accessible tributaries to the river.
6. The mean length of an angler day (the average length of time an angler fishes per day) was found to be 1.1, 2.5, 2.2 and 0.8 hours for June through September, respectively.
7. Angler effort in the entire system was highest in August, 3,265 ( $\pm 705$ ) angler days with September, July and June following in descending order at 2,393 ( $\pm 1,799$ ), 1,620 ( $\pm 181$ ) and 240 ( $\pm 225$ ). The four month total effort was estimated at 7,518 ( $\pm 1,122$ ) angler days. Angler effort was also calculated for each of the

nine study sections. The total efforts calculated for the four months, in decreasing order were: Allison and Summers creeks ( $2,781 \pm 585$ ), Similkameen River between the Old Hedley Road bridge and Princeton ( $2,201 \pm 411$ ), the Ashnola River ( $1,732 \pm 404$ ), Similkameen River above Similkameen Falls ( $1,723 \pm 408$ ), the Tulameen River ( $449 \pm 465$ ), Similkameen River between Keremeos and the Old Hedley Road bridge ( $354 \pm 258$ ) and Similkameen River between the Canada-U.S. border and Keremeos ( $200 \pm 236$ ). No effort was observed between Princeton and Similkameen Falls or between Enloe Dam and the border on the Similkameen River. Mean daily angler effort on weekends, weekdays and monthly were also calculated for the entire system as well as for the individual study sections and are presented in the body of the report.

8. The estimated catch of all species of fish for the entire river system from June through September was  $10,791 \pm 3,253$  fish with an estimated harvest of 43% ( $4,619 \pm 1,893$  fish). The major fish species caught were rainbow trout (70%) and brook trout (30%). Occasional catches of mountain whitefish and one cutthroat trout were observed. Brook trout were only present in the Allison/Summers Creek survey section. The highest catches and harvest were observed in the Ashnola River ( $7,063 \pm 3,060$ , and  $2,405 \pm 1,546$ ), Allison/Summers Creek ( $5,557 \pm 8,428$  and  $1,879 \pm 2,365$ ) and the Similkameen River above Similkameen Falls ( $2,038 \pm 712$  and  $648 \pm 237$ ). The catches in the other study sections, in decreasing order were the Similkameen River between Old Hedley Road bridge and Princeton ( $840 \pm 700$  and  $375 \pm 368$ ), the Tulameen River ( $329 \pm 529$  and  $149 \pm 303$ ), the Similkameen River between Keremeos and Old Hedley Road bridge (both  $87 \pm 151$ ) and between the U.S./Canada border and Keremeos (both  $30 \pm 120$ ). The percentage of the total catch for the system rose from 5% in June to 24% in July, peaked at 59% in August and dropped to 12% in September.
9. The mean daily catch per unit effort in the entire survey area was highest in June at 2.2 fish/hour and declined to 0.9 fish/hour in July, 0.8 fish/hour in August and 0.4 fish/hour in September.
10. The majority of anglers interviewed during the creel survey were using bait. Fifty-one percent of the anglers used bait, 31% flies and 18% lures. Bait

fishermen caught 44% of the fish caught in the system with 30% being caught on flies and 26% on lures.

11. The average fork length of the rainbow trout examined during the survey was  $196.7 \pm 32.4$  mm with an average weight of  $77.5 \pm 34.5$  g. The ranges in lengths and weights were 130-300 mm and 20.0 - 153.2 g. The fish ages ranged from 2+ to 6+ with 50% of the fish being 3+ and 41% 4+. Eleven of the rainbow trout sampled showed good growth more typical of a lake environment and are believed to have originated in adjacent lakes.

The average fork length of age 2+ and 3+ brook trout in the Allison/Summers Creek was 181.0 and 198.0 mm, respectively. Mean weights were 68.3 and 88.4 g, respectively.

12. At present, there is no size restriction on the trout harvested. If steelhead trout were introduced into the system, at least a 20 cm (8 in.) size limit would most likely be imposed in keeping with the present coastal size limits for trout in streams where steelhead are present. Over 57% of the measured rainbow trout kept by fishermen during the creel survey were under 20 cm in length. If this regulation was instituted, it would significantly curtail the harvest of wild rainbow trout as well as protect the steelhead trout smolts.
13. During the angler survey, anglers were asked questions concerning steelhead trout introduction into the Similkameen River system. To the question of whether or not they favoured steelhead trout introduction, 88% were in favour, 9% were undecided and only 3% were against the idea. The people opposed cited reasons which included: they liked the river as is; there were other streams in the province to fish for steelhead; too many people would come to the area to fish; too many fishing restrictions would be imposed; and steelhead may affect the brook trout population in Summers Creek. The majority of people in favour of the project felt that fishing would be improved, more steelhead would be available in the province, increased tourism would result and better fishing regulations and enforcement would also result.



14. Anglers were also asked if they would make a special trip to the Similkameen River system to fish for steelhead trout. The responses were almost even, 49% said yes and 48% said no with 3% undecided. This result reflects the large portion of casual, inexperienced anglers that fish the Similkameen system presently. However, a much larger proportion of the anglers are expected to be avid and experienced fishermen should steelhead be introduced. Of the anglers who would spend more time, 46% would spend at least a weekend, 16% a week or more and 38% a day or less. Also, those who wouldn't make a special trip would, however, spend more time fishing if steelhead were present. Of the 172 anglers who wouldn't make a special trip, 42% said they would spend extra time fishing (5% were undecided). Of the latter group, 78% said they would spend from a couple of hours to an extra day fishing. Overall, 30% of the interviewed anglers felt that steelhead trout introduction would not affect their angling effort and 70% would make a special trip or expend more effort fishing.
15. In conclusion, steelhead trout introduction is favoured by a majority of the anglers presently using the Similkameen River system and would not only compliment the present summer resident sport fishery, but substantially increase angling effort especially in the fall and spring when the steelhead would be available. Angling effort is presently very low during the latter two periods. The additional angling regulations which would be necessary with steelhead trout present, especially a minimum size limit in the range of 20 cm (8 in.) would benefit the resident rainbow trout population by reducing the harvest of older fish. A very substantial benefit to the Similkameen Region (and adjacent regions) in terms of increased angling opportunities and tourist revenue would result from steelhead trout introduction into the Similkameen River drainage upstream of Enloe Dam.

## 6.0 ACKNOWLEDGEMENTS

IEC BEAK Consultants Ltd. would like to acknowledge the contributions of a number of individuals to this project. Mr. L.B. Everson, BPA Contracting Officer and Mr. M.L. Fanning, IEC BEAK Project Principal, reviewed the report and provided overall study direction. Ms. C.M. Movold and J.M. Boyd conducted the angler interview portion of the study with Messrs. D.G. Hickey, I.W. Whyte and S.W. Stogran conducting the aerial surveys. Mr. Hickey and Ms. Movold analyzed the data and drafted the report.

We are especially grateful to our project pilot, Mr. D. Boisvert, whose expert planning and extensive flying experience enabled us to safely and accurately conduct the aerial angler counts within the mountainous Similkameen River basin.

We would also like to thank Mr. C.J. Bull and Mr. S. Matthews of B.C. Fish and Wildlife for their support and interest in our project.

IEC BEAK would also like to express our gratitude to the numerous anglers who took the time to answer our interview questions.

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## TABLES



**TABLE 3-1**  
**Sampling Schedule Design Probabilities**

River Section	Sample Section Probability	Probability of Finding an Angler Anywhere in the System During Any One Time Period	
		AM (P = 0.4)	PM (P = 0.6)
1. Enloe Dam - Border	0.10	0.04	0.06
2. Border - Keremeos	0.10	0.04	0.06
3. Keremeos - Old Hedley Rd. Bridge	0.13	0.05	0.08
4. Old Hedley Rd. Bridge - Princeton	0.12	0.05	0.07
5. Princeton - Similkameen Falls	0.05	0.02	0.03
6. Similkameen Falls - Headwaters Similkameen River	0.20	0.08	0.12
7. Ashnola River	0.15	0.06	0.09
8. Tulameen River	0.05	0.02	0.03
9. Summers and Allison Creeks	<u>0.10</u>	<u>0.04</u>	<u>0.06</u>
TOTAL	1.00	0.40	0.60

**TABLE 3-2**  
**Creel Survey Sampling Schedule**

	SUN	MON	TUE	WED	THUR	FRI	SAT
JUNE	17	18	19	20	21	22	23 PM 7 AM 8
JUNE	24** AM 6 PM 4	25 PM 4 PM 6	26 AM 3 AM 6	27 AM 7 PM 2	28** <sup>a</sup> PM 3 Pm 6	29 AM 4 AM 5	30 PM 9 PM 7
	1	2* Holiday	3	4*	5	6	7
JULY	AM 6 PM 7	AM 5 AM 6	PM 2 PM 4	AM 1 PM 6	PM 6 AM 5	PM 3 PM 9	AM 5 PM 4
JULY	8* PM 2 AM 6	9 PM 7 PM 1	10 PM 1 PM 7	11 AM 7 PM 7	12* AM 9 PM 4	13 AM 5 PM 6	14* AM 4 PM 8
JULY	15 AM 4 AM 3	16 PM 4 AM 6	17	18* PM 1 PM 8	19	20 PM 8 AM 9	21** AM 9 AM 6
JULY	22 AM 6 AM 1	23 PM 6 PM 7	24	25	26* AM 5 PM 3	27 AM 3 PM 6	28 AM 4 AM 6
JULY/AUG	29* PM 4 AM 3	30 PM 6 PM 9	31** PM 5 PM 4	1	2 PM 7 AM 9	3	4 AM 3 PM 6
AUG	5 AM 4 PM 1	6 Holiday PM 4 AM 7	7* PM 6 PM 5	8 PM 8 AM 9	9	10	11 PM 8 PM 7
AUG	12 <sup>a</sup> * AM 4 AM 1	13 PM 7 AM 7	14** PM 2 AM 6	15 PM 5 PM 4	16	17	18 PM 2 AM 3
AUG	19** PM 1 PM 6	20 PM 1 AM 5	21 PM 9 PM 7	22	23* PM 9 PM 2	24	25 AM 6 PM 6
AUG/SEPT	26* PM 8 PM 4	27	28	29 PM 2 PM 4	30 PM 8 AM 8	31* <sup>a</sup> PM 4 AM 4	1 PM 9 AM 5
SEPT	2** PM 5 PM 9	3 Holiday PM 4 PM 1	4	5** <sup>a</sup> PM 1 AM 4	6 AM 1 PM 6	7	8 AM 1 PM 6

\* Flight days (stream sections being sampled only).

\*\* Whole system flight.

<sup>a</sup> Flight not flown due to inclement weather.



**TABLE 3-3**  
**Malvestuto et al.'s (1978) Method of Calculating Catch,**  
**Effort and Catch Per Unit Effort (CPUE)**

1. For a given sampling period multiply fisherman count (instaneous count) by the number of hours contained within the period to give an estimate of the total effort (e) expended during the period within the river section sampled  $e = (\text{No. fishermen}) (\text{No. hours})$ .

2. Calculate  $e/p_1 p_2 = E$

$p_1$  = sampling probability with the particular sampling period (eg. AM = 0.4).

$p_2$  = sampling probability associated with the particular river section.

$E$  = total effort expended on the entire river during the entire day.

3. Calculate  $CPUE = B/P$

$B$  = total number of fish caught of all anglers interviewed during the sampling period

$P$  = total measured pressure recorded for all interviews taken during the sampling period

= number of hours for the incomplected trip x the number of fishermen in the party

This is an estimate of CPUE for the day during which the sample is taken.

4.  $CPUE \times E = C$

$C$  = total catch for the entire river during the entire sample day.

5.  $\sum_{i=1}^{n_h} C_h/n_h = y_h$  = mean daily catch for each stratum

$C_h$  = estimated catch for the  $i$ th day within the  $h$ th stratum

$n_h$  = number of days sampled with the  $h$ th stratum

6. 
$$\frac{\sum_{i=1}^{n_h} C^2_{hi} - \left( \sum_{i=1}^{n_h} C_{hi} \right)^2 / n_h}{n_h - 1} = v_h$$
 = variance for each  $y_h$

**TABLE 3-3 (Continued)**  
**Malvestuto et al.'s (1978) Method of Calculating Catch,**  
**Effort and Catch Per Unit Effort (CPUE)**

7.  $\sum_{h=1}^L N_h (\bar{y}_h)/N = \bar{y}_d = \text{mean daily catch per month}$   
 $N_h =$  total number of days within the hth stratum  
 $N =$  total number of days within the month  
 $L =$  number of strata
8.  $\sum_{h=1}^L W_h^2 v_h/n_h - \sum_{h=1}^L W_h v_h/N = v = \text{variance of } y_d$   
 $W_h =$  stratum weight ( $N_h/N$ )  
 $v =$  se = standard error of  $y_d$
9.  $Ny_d = Y = \text{total harvest for the month}$
10.  $N(\text{se}) = S = \text{standard error of } Y.$
11. 95% confidence limits for the total harvest are  $Y \pm t_{0.05} s$ . The degrees of freedom which determine the t-value can be approximated using the number midway between the smallest value of  $n_h-1$  and  $n_h$ .
12. Monthly total effort  $\pm s$  can be estimated by substituting  $E_{hi}$  into steps (5)-(10) in place of  $C_{hi}$ , where E for each sampled day is calculated as in step (2).
13. CPUE  $\pm s$  for each month can be estimated by substituting  $CPUE_{hi}$  for  $C_{hi}$  in steps (5)-(8) where CPUE for each sampled day was calculated as in step (3).

**TABLE 3-4**  
**Sample Section Probability (Probability of Finding an Angler in**  
**each Section) Based on Aerial and Ground Counts**

River Section	Sample Section Probability			
	June	July	August	September
1. Enloe Dam - Border	0	0	0	0
2. Border - Keremeos	0	0	0.05	0
3. Keremeos - Old Hedley Rd. Bridge	0	0.05	0.15	0
4. Old Hedley Rd. Bridge - Princeton	0	0.20	0.15	0.25
5. Princeton - Similkameen Falls	0	0	0	0
6. Similkameen Falls - Headwaters Similkameen River	0.20	0.20	0.15	0.25
7. Ashnola River	0.20	0.20	0.40	0
8. Tulameen River	0	0.05	0.05	0
9. Summers and Allison Creeks	<u>0.60</u>	<u>0.30</u>	<u>0.05</u>	<u>0.50</u>
TOTAL	1.00	1.00	1.00	1.00

TABLE 4-1  
Summary of Angler Residency

WEEKENDS

Angler Residence	Local			B.C.			Canada			Foreign		
Location	June	July	Aug.	Sept.	June	July	Aug.	Sept.	June	July	Aug.	Sept.
Above Similkameen Falls	-	-	5	-	-	20	25	5	-	-	1	-
Below Similkameen Falls	-	4	1	2	2	8	10	3	-	5	6	-
Ashnola River	2	4	7	-	1	5	12	-	-	2	1	-
Tulameen River	-	-	-	-	-	-	5	-	-	-	-	-
Allison and Summers Creeks	-	-	-	4	21	5	-	27	2	-	-	-
Monthly Total	2	8	13	6	24	38	52	35	2	5	8	0
Season Total	29			149			15			8		

TABLE 4-1 (Continued)  
Summary of Angler Residency

WEEKDAYS

Angler Residence	Local			B.C.			Canada			Foreign		
Location	June	July	Aug.	Sept.	June	July	Aug.	Sept.	June	July	Aug.	Sept.
Above Similkameen Falls	-	-	-	-	3	16	6	2	-	3	1	-
Below Similkameen Falls	1	1	5	-	-	4	11	-	-	4	2	-
Ashnola River	-	3	6	-	-	8	27	-	-	-	2	-
Tulameen River	-	-	2	-	-	2	2	-	-	-	1	-
Allison and Summers Creeks	-	5	1	-	-	5	4	-	-	-	-	-
Monthly Total	1	9	14	0	3	35	50	2	0	9	5	0
Season Total	24			90			9			12		
Total Weekends and Weekdays	53			239			24			20		

**TABLE 4-2**  
**Summary of the Purpose of Each Angler Trip to the Similkameen River System**

Location	WEEKEND										WEEKDAY									
	Main Purpose to Fish					Was not Main Purpose to Fish					Main Purpose to Fish					Was not Main Purpose to Fish				
	June	July	Aug.	Sept.	Total	June	July	Aug.	Sept.	Total	June	July	Aug.	Sept.	Total	June	July	Aug.	Sept.	Total
Above Similkameen Falls	-	6	10	1	17	-	14	21	4	39	2	6	2	-	10	3	14	4	2	23
Below Similkameen Falls	-	14	2	1	17	2	3	21	4	30	1	3	6	-	10	-	10	12	-	22
Ashnola River	3	8	16	-	27	-	1	6	-	7	-	7	22	-	29	-	4	13	-	17
Tulameen River	-	-	-	-	0	-	-	5	-	5	-	-	1	-	1	-	2	4	-	5
Allison and Summers Creeks	17	4	-	17	38	6	1	-	14	21	-	7	1	-	8	-	5	4	-	9
Monthly Total	20	32	28	19	99	8	19	53	22	102	3	23	32	-	58	3	35	37	2	77
Weekend and weekday Total	179																			

**TABLE 4-3**  
**Mean Length of an Angler Day on the Similkameen River System**  
**as Determined From Completed Fishing Trips**

Month	% Anglers Interviewed with Completed Fishing Trip	Average Length of Angler Day (hrs.)
June	24	1.1
July	28	2.5
Aug.	24	2.2
Sept.	14	0.8

TABLE 4-4  
Estimated Angler Effort Summary for the  
Similkameen River System

	Weekends	Weekdays	Monthly	Monthly	Ratio of Effort Weekends to Weekdays
	Mean Daily Effort Hours (95% C.L.)*	Mean Daily Effort Hours (95% C.L.)	Mean Daily Effort Hours (95% C.L.)	Total Effort Hours (95% C.L.)	Total Effort Angler Days (95% C.L.)
June	75 (+ 301)	15 (+ 95)	33 (+ 31)	264 (+ 248)	240 (+ 225)
July	189 (+ 350)	103 (+ 285)	131 (+ 15)	4,049 (+ 453)	1,620 (+ 181)
Aug.	279 (+ 546)	212 (+ 527)	232 (+ 50)	7,183 (+ 1,551)	3,265 (+ 705)
Sept.	105 (+ 273)	40 (+ 180)	64 (+ 48)	1,914 (+ 1,439)	2,393 (+ 1,799)
			Total	13,410 (+ 2,019)	7,518 (+ 1,122)

\* 95% C.L. = 95% confidence limits.



TABLE 4-5  
Estimated Angler Effort Summary for the Ashnola River

	Weekends	Weekdays	Monthly	Monthly	Total Effort Angler Days (95% C.L.)	% Angler Days of System Total
	Mean Daily Effort Hours (95% C.L.)*	Mean Daily Effort Hours (95% C.L.)	Mean Daily Effort Hours (95% C.L.)	Total Effort Hours (95% C.L.)		
June	20 (+ 359)	0	6 (+ 25)	48 (+ 200)	44 (+ 182)	10
July	60 (-) <sup>a</sup>	23 (+ 46)	33 (+ 15)	990 (+ 458)	396 (+ 183)	19
Aug.	105 (+ 269)	86 (+ 210)	92 (+ 62)	2,843 (+ 1,919)	1,292 (+ 872)	42
Sept.	- <sup>b</sup>	-	-	-	-	-
			Total	3,881 (+ 1,577)	1,732 (+ 704)	18

\* 95% C.L. = 95% confidence limits.

a = No confidence limits, only one sample.

b = No fishing pressure occurred.

**TABLE 4-6**  
**Estimated Angler Effort Summary for the Similkameen River**  
**Above Similkameen Falls**

	Weekends		Weekdays		Monthly		Monthly		% Angler Days of System Total
	Mean Daily Effort Hours (95% C.L.)*	Mean Daily Effort Hours (95% C.L.)	Mean Daily Effort Hours (95% C.L.)	Mean Daily Effort Hours (95% C.L.)	Total Effort Hours (95% C.L.)	Total Effort Hours (95% C.L.)	Total Effort Angler Days (95% C.L.)	Total Effort Angler Days (95% C.L.)	
June	0	10 (+ 43)	7 (+ 11)	56 (+ 88)	51 (+ 80)	12			
July	41 (+ 50)	25 (+ 44)	30 (+ 11)	933 (+ 337)	373 (+ 135)	18			
Aug.	58 (+ 40)	28 (+ 225)	36 (+ 24)	1,123 (+ 749)	511 (+ 341)	17			
Sept.	40 (-) <sup>a</sup>	10 (-)	20 (-)	630 (-)	788 (-)	21			
			Total	2,742 (+ 649)	1,723 (+ 408)	18			

\* 95% C.L. = 95% confidence limits.  
a = No confidence limits, only one sample.

**TABLE 4-7**  
**Estimated Angler Effort Summary for the Similkameen River**  
**Between Old Hedley Rd. Bridge and Princeton**

	Weekends	Weekdays	Monthly	Monthly	
	Mean Daily Effort Hours (95% C.L.)*	Mean Daily Effort Hours (95% C.L.)	Mean Daily Effort Hours (95% C.L.)	Total Effort Hours (95% C.L.)	% Angler Days of System Total
June	a	-	-	-	-
July	55 (+ 95)	10 (+ 37)	25 (+ 14)	760 (+ 417)	14
Aug.	52 (+ 98)	29 (+ 46)	35 (+ 15)	1,094 (+ 478)	16
Sept.	50 (-)	30 (-)	37 (-)	1,120 (-)	36
			Total	2,974 (+ 556)	23

\* 95% C.L. = 95% confidence limits.

a = No fishing pressure occurred.

b = No confidence limits, only one sample.

TABLE 4-8  
Estimated Angler Effort Summary for the Similkameen River  
Between Keremeos and Old Hedley Road Bridge

	Weekends	Weekdays	Monthly	Monthly	% Angler Days of System Total
	Mean Daily Effort Hours (95% C.L.)*	Mean Daily Effort Hours (95% C.L.)	Mean Daily Effort Hours (95% C.L.)	Total Effort Hours (95% C.L.)	Total Effort Angler Days (95% C.L.)
June	a	-	-	-	-
July	8 (+ 135)	17 (+ 66)	14 (+ 20)	425 (+ 621)	170 (+ 248)
Aug.	45 (+ 269)	N.S.	13 (+ 54)	405 (+ 1,674)	184 (+ 761)
Sept.	-	-	-	-	-
			Total	830 (+ 605)	354 (+ 258)
					4

\* 95% C.L. = 95% confidence limits.  
a = No fishing pressure occurred.  
N.S. = Not sampled.

TABLE 4-9  
Estimated Angler Effort Summary for the Tulameen River

	Weekends		Weekdays		Monthly		Monthly		% Angler Days of System Total
	Mean Daily Effort Hours (95% C.L.)*	Mean Daily Effort Hours (95% C.L.)	Mean Daily Effort Hours (95% C.L.)	Mean Daily Effort Hours (95% C.L.)	Total Effort Hours (95% C.L.)	Total Effort Hours (95% C.L.)	Total Effort Angler Days (95% C.L.)	Total Effort Angler Days (95% C.L.)	
June	- <sup>a</sup>	-	-	-	-	-	-	-	-
July	20 (-) <sup>b</sup>	10 (+ 179)	13 (+ 29)	13 (+ 29)	409 (+ 907)	409 (+ 907)	164 (+ 363)	164 (+ 363)	8
Aug.	25 (+ 450)	18 (+ 102)	20 (+ 37)	20 (+ 37)	626 (+ 1,144)	626 (+ 1,144)	285 (+ 520)	285 (+ 520)	9
Sept.	-	-	-	-	-	-	-	-	-
				Total	1,035 (+ 1,072)	1,035 (+ 1,072)	449 (+ 465)	449 (+ 465)	5

\* 95% C.L. = 95% confidence limits.

a = No fishing pressure occurred.

b = No confidence limits, only one sample.

**TABLE 4-10**  
**Estimated Angler Effort Summary for the Similkameen River**  
**Between Canada/U.S. Border and Keremeos**

	Weekends	Weekdays	Monthly	Monthly	Total Effort Hours (95% C.L.)	Total Effort Angler Days (95% C.L.)	% Angler Days of System Total
	Mean Daily Effort Hours (95% C.L.)*	Mean Daily Effort Hours (95% C.L.)	Mean Daily Effort Hours (95% C.L.)	Total Effort Hours (95% C.L.)	Total Effort Angler Days (95% C.L.)		
June	- <sup>a</sup>	-	-	-	-	-	-
July	-	-	-	-	-	-	-
Aug.	0	20 (+ 43)	14 (+ 17)	440 (+ 520)	200 (+ 263)	7	
Sept.	-	-	-	-	-	-	-
			Total	440 (+ 520)	200 (+ 236)	2	

\* 95% C.L. = 95% confidence limits.  
a = No fishing pressure occurred.

TABLE 4-11  
Estimated Angler Effort Summary for  
Allison and Summers Creeks

	Weekends	Weekdays	Monthly	Monthly	
	Mean Daily Effort Hours (95% C.L.)*	Mean Daily Effort Hours (95% C.L.)	Mean Daily Effort Hours (95% C.L.)	Total Effort Hours (95% C.L.)	Total Effort Angler Days (95% C.L.)
June	150 (-) <sup>a</sup>	N.S. <sup>b</sup>	45 (-)	360 (-)	327 (-)
July	105 (-)	34 (+ 24)	57 (+ 8)	1,761 (+ 247)	704 (+ 99)
Aug.	N.S.	10 (+ 64)	7 (+ 21)	220 (+ 658)	100 (+ 299)
Sept.	120 (+ 179)	N.S.	44 (+ 36)	1,320 (+ 1,078)	1,650 (+ 1,348)
			Total	3,661 (+ 770)	2,781 (+ 585)
					30

\* 95% C.L. = 95% confidence limits.

a = No confidence limits, only one sample.

b N.S. = Not sampled.

TABLE 4-12  
Summary of Number of Anglers Interviewed and Targeted Fish Species

Location	Date	Rainbow Trout	Brook Trout	Whitefish
Below Similkameen Falls	June	2	NP <sup>1</sup>	1
	July	28	NP	2
	Aug.	41	NP	0
	Sept.	5	NP	0
	Total	76		3
Above Similkameen Falls	June	5	NP	NP
	July	40	NP	NP
	Aug.	37	NP	NP
	Sept.	7	NP	NP
	Total	89		
Ashnola River	June	3	NP	0
	July	20	NP	0
	Aug.	57	NP	0
	Sept.	-	NP	-
	Total	80		0
Tulameen River	June	0	NP	0
	July	2	NP	0
	Aug.	10	NP	0
	Sept.	-	NP	-
	Total	12		0
Allison & Summers Creeks	June	6	17	NP
	July	3	14	NP
	Aug.	0	5	NP
	Sept.	0	31	NP
	Total	9	67	

<sup>1</sup> NP = Not present.  
- = Not sampled.



TABLE 4-13  
Observed Catch and Harvest of Rainbow Trout

	WEEKEND						WEEKDAY					
	June		July		Aug.		Sept.		June		July	
	Caught	Kept	Caught	Kept	Caught	Kept	Caught	Kept	Caught	Kept	Caught	Kept
Above Similkameen Falls	0	0	11	4	55	9	4	4	8	0	33	4
											1	0
Below Similkameen Falls	0	0	25	14	5	2	0	0	0	0	7	7
											4	2
											0	0
Ashnola River	8	5	17	10	202	47	1	-	0	0	20	18
											38	14
											-	-
Tulameen River	0	0	0	0	0	0	-	-	-	-	5	0
											2	1
											-	-
Allison and Sumners Creeks	14	9	1	0	0	0	6	0	-	-	4	4
											5	2
											-	-
Total	22	14	54	27	262	58	10	4	8	0	69	33
											50	19
											0	0
Grand Total Caught - 475												
Grand Total Kept - 155												

1 - = Not sampled

TABLE 4-14  
Observed Catch and Harvest of Mountain Whitefish

		WEEKEND				WEEKDAY							
		June	July	Aug.	Sept.	June	July	Aug.	Sept.				
		Caught	Kept	Caught	Kept	Caught	Kept	Caught	Kept	Caught	Kept	Caught	Kept
		NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
Above	NP <sup>1</sup>												
Similkameen													
Falls													
Below													
Similkameen													
Falls													
Ashnola													
River													
Tulameen													
River													
Allison and													
Summers													
Creeks													
Total													
Grand Total Caught - 10													
Grand Total Kept - 8													

<sup>1</sup> NP = Not present  
2 - = Not sampled

TABLE 4-15  
Observed Catch and Harvest of Brook Trout

	WEEKEND				WEEKDAY							
	June	July	Aug.	Sept.	June	July	Aug.	Sept.	June	July	Aug.	Sept.
	Caught	Kept	Caught	Kept	Caught	Kept	Caught	Kept	Caught	Kept	Caught	Kept
Above Similkameen Falls	NP <sup>1</sup>	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
Below Similkameen Falls	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
Ashnola River	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
Tulameen River	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
Allison and Summers Creeks	44	34	9	0	0	0	57	11	0	0	19	10
Total	44	34	9	0	0	0	57	11	0	0	19	10
Grand Total Caught - 138												
Grand Total Kept - 62												

<sup>1</sup> NP = Not present

<sup>2</sup> - = Not sampled

TABLE 4-16  
Estimated Catch and Harvest Summary for  
the Similkameen River System

	Weekends			Weekdays			Monthly		
	Mean Daily Catch (95% C.L.)*	Mean Daily Harvest (95% C.L.)	Mean Daily Catch (95% C.L.)	Mean Daily Harvest (95% C.L.)	Mean Daily Catch (95% C.L.)	Mean Daily Harvest (95% C.L.)	Total Catch (95% C.L.)	Total Harvest (95% C.L.)	% of Total Catch Harvested
June	161 (+ 647)	133 (+ 555)	33 (+ 172)	0	71 (+ 64)	40 (+ 48)	568 (+ 512)	320 (+ 384)	56
July	109 (+ 324)	53 (+ 199)	69 (+ 244)	37 (+ 178)	82 (+ 12)	42 (+ 9)	2,539 (+ 384)	1,312 (+ 290)	51
Aug.	318 (+ 1,065)	64 (+ 235)	159 (+ 957)	91 (+ 621)	205 (+ 91)	83 (+ 59)	6,361 (+ 2,830)	2,567 (+ 1,817)	40
Sept.	120 (+ 554)	38 (+ 170)	0	0	44 (+ 63)	14 (+ 19)	1,323 (+ 1,875)	420 (+ 574)	32
						Total	10,791 (+ 3,253)	4,619 (+ 1,893)	43

\* 95% C.L. = 95% Confidence Limits.

TABLE 4-17

Estimated Catch and Harvest Summary for all Fish Species Excluding  
Brook Trout in the Similkameen River System

	Weekends			Weekdays			Monthly		
	Mean Daily Catch (95% C.L.)*	Mean Daily Harvest (95% C.L.)	Mean Daily Catch (95% C.L.)	Mean Daily Harvest (95% C.L.)	Mean Daily Catch (95% C.L.)	Mean Daily Harvest (95% C.L.)	Total Catch (95% C.L.)	Total Harvest (95% C.L.)	% of Total Catch Harvested
June	107 (+ 555)	96 (+ 515)	33 (+ 172)	0	55 (+ 57)	29 (+ 44)	440 (+ 456)	232 (+ 352)	52
July	97 (+ 314)	53 (+ 199)	49 (+ 183)	29 (+ 141)	64 (+ 9)	37 (+ 7)	1,997 (+ 265)	1,135 (+ 221)	57
Aug.	318 (+ 1,065)	64 (+ 235)	99 (+ 413)	44 (+ 216)	163 (+ 41)	50 (+ 21)	5,044 (+ 1,273)	1,541 (+ 313)	31
Sept.	25 (+ 146)	22 (+ 147)	0	0	9 (+ 16)	8 (+ 17)	276 (+ 491)	243 (+ 498)	88
						Total	7,757 (+ 1,399)	3,151 (+ 653)	40

\* 95% C.L. = 95% Confidence Limits.

**TABLE 4-18**  
**Estimated Catch Per Unit Effort (CPUE) and Harvest Per Unit**  
**Effort (HPUE) Summary for the Similkameen River System**

	Weekends		Weekdays		Monthly	
	Mean Daily CPUE fish/hr. (95% C.L.)*	Mean Daily HPUE fish/hr. (95% C.L.)	Mean Daily CPUE fish/hr. (95% C.L.)	Mean Daily HPUE fish/hr. (95% C.L.)	Mean Daily CPUE fish/hr. (95% C.L.)	Mean Daily HPUE fish/hr. (95% C.L.)
June	2.2 (+ 9.0)	1.9 (+ 12.1)	2.2 (+ 4.0)	0	2.2 (+ 0.7)	0.6 (+ 0.6)
July	0.5 (+ 1.0)	0.2 (+ 0.8)	1.1 (+ 2.8)	0.6 (+ 2.3)	0.9 (+ 0.3)	0.5 (+ 0.3)
Aug.	1.4 (+ 3.7)	0.3 (+ 1.0)	0.6 (+ 1.8)	0.2 (+ 1.0)	0.8 (+ 0.3)	0.2 (+ 0.2)
Sept.	1.1 (+ 3.6)	0.4 (+ 2.0)	0	0	0.4 (+ 0.6)	0.2 (+ 0.3)

\* 95% C.L. = 95% Confidence Limits.

TABLE 4-19  
Estimated Catch and Harvest Summary  
for the Ashnola River

	Weekends				Weekdays				Monthly			
	Mean Daily Catch (95% C.L.)*	Mean Daily Harvest (95% C.L.)	Mean Daily Catch (95% C.L.)	Mean Daily Harvest (95% C.L.)	Mean Daily Catch (95% C.L.)	Mean Daily Harvest (95% C.L.)	Total Catch (95% C.L.)	% of System Total	Total Harvest (95% C.L.)	% of System Total	% of Total Catch Harvested	
June	54 (+ 971)	50 (+ 898)	0	0	16 (+ 66)	15 (+ 61)	128 (+ 528)	15	120 (+ 488)	22	94	
July	48 -	30 -	22 (+ 81)	21 (+ 82)	30 (+ 27)	24 (+ 28)	933 (+ 838)	22	741 (+ 858)	38	79	
Aug.	479 (+ 1,968)	110 (+ 836)	77 (+ 289)	25 (+ 147)	194 (+ 120)	50 (+ 56)	6,002 (+ 3,726)	72	1,544 (+ 1,747)	66	26	
Sept.	- <sup>a</sup>	-	-	-	-	-	-	0	-	-	-	
						Total	7,063 (+ 3,060)	44	2,405 (+ 1,546)	43	34	

\* 95% C.L. = 95% confidence limits.

a = No fishing pressure occurred.

TABLE 4-20  
Estimated Catch Per Unit Effort (CPUE) and Harvest Per  
Unit Effort (HPUE) Summary for the Astnola River

	Weekends		Weekdays		Monthly	
	Mean Daily CPUE fish/hr. (95% C.L.)*	Mean Daily HPUE fish/hr. (95% C.L.)	Mean Daily CPUE fish/hr. (95% C.L.)	Mean Daily HPUE fish/hr. (95% C.L.)	Mean Daily CPUE fish/hr. (95% C.L.)	Mean Daily HPUE fish/hr. (95% C.L.)
June	2.7 (-) <sup>1</sup>	2.5 (-)	0	0	0.9 (-)	0.8 (-)
July	0.8 -	0.5 -	1.3 (+ 4.8)	1.3 (+ 5.1)	1.1 (+ 1.6)	1.0 (+ 1.7)
Aug.	4.5 (+ 7.2)	1.0 (+ 5.3)	1.1 (+ 4.2)	0.3 (+ 1.6)	2.1 (+ 1.2)	0.5 (+ 0.2)
Sept.	2 -	-	-	-	-	-

\* 95% C.L. = 95% Confidence Limits.  
1 No confidence limits, only one sample.  
2 No fishing pressure occurred.



**TABLE 4-21**  
**Estimated Catch and Harvest Summary for all fish**  
**in Allison and Summers Creeks**

	Weekends			Weekdays			Monthly			Monthly		
	Mean Daily Catch (95% C.L.)*	Mean Daily Harvest (95% C.L.)	Mean Daily Catch (95% C.L.)	Mean Daily Harvest (95% C.L.)	Mean Daily Catch (95% C.L.)	Mean Daily Harvest (95% C.L.)	Total Catch (95% C.L.)	% of System Total	Total Harvest (95% C.L.)	% of System Total	% of Total Catch Harvested	
June	255 (-) <sup>a</sup>	180 (-)	N.S.	N.S.	77 (-)	54 (-)	616 (-)	74	432 (-)	78	70	
July	84 (-)	0	63 (+196)	33 (+153)	70 (+65)	22 (+51)	2,164 (+2,022)	51	693 (+1,588)	36	32	
Aug.	N.S.	N.S.	28 (+178)	18 (+115)	20 (+60)	13 (+38)	617 (+1,845)	7	397 (+1,184)	17	64	
Sept.	197 (+2,541)	33 (+584)	N.S.	N.S.	72 (+510)	12 (+117)	2,160 (+15,285)	84	357 (+3,507)	47	17	
						Total	5,557 (+8,428)	35	1,879 (+2,365)	34	33	

\* 95% C.L. = 95% confidence limits.  
a = No confidence limits, only one sample.  
N.S. = not sampled.

**TABLE 4-22**  
**Estimated Catch Per Unit Effort (CPUE) and Harvest Per**  
**Unit Effort (HPUE) Summary for Allison and Summers Creeks**

	Weekends		Weekdays		Monthly	
	Mean Daily CPUE fish/hr. (95% C.L.)*	Mean Daily HPUE fish/hr. (95% C.L.)	Mean Daily CPUE fish/hr. (95% C.L.)	Mean Daily HPUE fish/hr. (95% C.L.)	Mean Daily CPUE fish/hr. (95% C.L.)	Mean Daily HPUE fish/hr. (95% C.L.)
June	1.7 (-) <sup>1</sup>	1.2 (-)	N.S. <sup>2</sup>	N.S.	0.5 (-)	0.4 (-)
July	0.8 (-)	0	2.1 (+ 6.7)	1.1 (+ 5.1)	1.7 (+ 2.2)	0.7 (+ 1.7)
Aug.	N.S.	N.S.	0.7 (+ 4.5)	0.5 (+ 2.8)	0.5 (+ 1.5)	0.3 (+ 0.6)
Sept.	1.6 (+ 19.1)	0.3 (+ 4.4)	N.S.	N.S.	0.6 (+ 3.8)	0.1 (+ 0.9)

\* 95% C.L. = 95% Confidence Limits.

<sup>1</sup> No confidence limits, only one sample.

<sup>2</sup> N.S. = Not sampled.

TABLE 4-23  
Estimated Catch and Harvest Summary for Rainbow Trout  
in Allison and Summers Creeks

	Weekends				Weekdays				Monthly			
	Mean Daily Catch (95% C.L.)*	Mean Daily Harvest (95% C.L.)	Mean Daily Catch (95% C.L.)	Mean Daily Harvest (95% C.L.)	Mean Daily Catch (95% C.L.)	Mean Daily Harvest (95% C.L.)	Mean Daily Catch (95% C.L.)	Mean Daily Harvest (95% C.L.)	Total Catch (95% C.L.)	% of System Total	Total Harvest (95% C.L.)	% of System Total
June	60 (-) <sup>a</sup>	45 (-)	N.S.	N.S.	18 (-)	14 (-)	144 (-)	112 (-)	17	20	78	
July	11 (-)	0	12 (+47)	12 (+47)	8 (+16)	363 (483)	251 (+483)	69	8	13		
Aug.	N.S.	N.S.	10 (+64)	4 (+25)	7 (+21)	220 (+661)	87 (+266)	40	3	4		
Sept.	7 (+117)	0	N.S.	N.S.	2 (+23)	72 (+686)	0	0	3	0	0	
Total							799 (+698)	450 (+400)	5	8	56	

\* 95% C.L. = 95% confidence limits.  
<sup>a</sup> = No confidence limits, only one sample.  
 N.S. = not sampled.

TABLE 4-24  
Estimated Catch and Harvest Summary for Brook Trout  
in Allison and Summers Creeks

	Weekends			Weekdays			Monthly			Monthly		
	Mean Daily Catch (95% C.L.)*	Mean Daily Harvest (95% C.L.)	Mean Daily Catch (95% C.L.)	Mean Daily Harvest (95% C.L.)	Mean Daily Catch (95% C.L.)	Mean Daily Harvest (95% C.L.)	Mean Daily Catch (95% C.L.)	Mean Daily Harvest (95% C.L.)	% of System Total	Total Harvest (95% C.L.)	% of System Total	% of Total Catch Harvested
June	195 (-) <sup>a</sup>	135 (-)	N.S.	N.S.	59 (-)	41 (-)	472 (-)	328 (-)	57	440 (+ 1,381)	23	69
July	74 (-)	0	51 (+ 184)	21 (+ 134)	58 (+ 61)	14 (+ 45)	1,807 (+ 1,904)	440 (+ 1,381)	43	307 (+ 917)	13	24
Aug.	N.S.	N.S.	18 (+ 115)	14 (+ 89)	13 (+ 38)	10 (+ 30)	397 (+ 1,184)	357 (+ 3,507)	5	2,100 (+ 14,561)	82	77
Sept.	190 (+ 2,427)	33 (+ 584)	N.S.	N.S.	70 (+ 485)	12 (+ 117)	4,776 (+ 7,971)	1,432 (+ 2,231)	30		26	17
						Total						30

\* 95% C.L. = 95% confidence limits.

a = No confidence limits, only one sample.

N.S. = not sampled.

TABLE 4-25

Estimated Catch Per Unit Effort (CPUE) and Harvest Per Unit  
Effort (HPUE) Summary for Brook Trout in Allison and Summers Creeks

	Weekends		Weekdays		Monthly	
	Mean Daily CPUE fish/hr. (95% C.L.)*	Mean Daily HPUE fish/hr. (95% C.L.)	Mean Daily CPUE fish/hr. (95% C.L.)	Mean Daily HPUE fish/hr. (95% C.L.)	Mean Daily CPUE fish/hr. (95% C.L.)	Mean Daily HPUE fish/hr. (95% C.L.)
June	1.3 (-) <sup>1</sup>	0.9 (-)	N.S. <sup>2</sup>	N.S.	0.4 (-)	0.3 (-)
July	0.7 (-)	0	1.7 (+ 6.1)	0.7 (+ 4.5)	1.4 (+ 2.0)	0.5 (+ 1.5)
Aug.	N.S.	N.S.	0.5 (+ 2.8)	0.4 (+ 2.2)	0.3 (+ 0.6)	0.2 (+ 0.7)
Sept.	1.5 (+ 17.8)	0.3 (+ 4.4)	N.S.	N.S.	0.6 (+ 3.6)	0.1 (+ 0.9)

\* 95% C.L. = 95% Confidence Limits.

<sup>1</sup> No confidence limits, only one sample.<sup>2</sup> N.S. = Not sampled.

TABLE 4-26

Estimated Catch Per Unit Effort (CPUE) and Harvest Per Unit Effort (HPUE) Summary for Rainbow Trout in Allison and Summers Creeks

	Weekends		Weekdays		Monthly	
	Mean Daily CPUE fish/hr. (95% C.L.)*	Mean Daily HPUE fish/hr. (95% C.L.)	Mean Daily CPUE fish/hr. (95% C.L.)	Mean Daily HPUE fish/hr. (95% C.L.)	Mean Daily CPUE fish/hr. (95% C.L.)	Mean Daily HPUE fish/hr. (95% C.L.)
June	0.4 (-) <sup>1</sup>	0.3 (-)	N.S. <sup>2</sup>	N.S.	0.1 (-)	0.1 (-)
July	0.1 (-)	0	0.4 (+ 1.6)	0.4 (+ 1.6)	0.3 (+ 0.5)	0.3 (+ 0.5)
Aug.	N.S.	N.S.	0.3 (+ 1.6)	0.1 (+ 0.6)	0.2 (+ 0.5)	0.1 (+ 0.2)
Sept.	0.1 (+ 0.9)	0	N.S.	N.S.	0.1 (+ 0.2)	0

\* 95% C.L. = 95% Confidence Limits.

<sup>1</sup> No confidence limits, only one sample.

<sup>2</sup> N.S. = Not sampled.

**TABLE 4-27**  
**Estimated Catch and Harvest Summary for the Similkameen River**  
**Above Similkameen Falls**

	Weekends				Weekdays				Monthly			
	Mean Daily Catch (95% C.L.)*	Mean Daily Harvest (95% C.L.)	Mean Daily Catch (95% C.L.)	Mean Daily Harvest (95% C.L.)	Mean Daily Catch (95% C.L.)	Mean Daily Harvest (95% C.L.)	Mean Daily Catch (95% C.L.)	Mean Daily Harvest (95% C.L.)	% of System Total	Total Harvest (95% C.L.)	% of System Total	% of Total Catch Harvested
June	0	0	16 (+ 112)	0	11 (+ 44)	0	88 (+ 352)	0	11	0	0	0
July	22 (+ 53)	8 (+ 52)	12 (+ 38)	2 (+ 14)	15 (+ 10)	4 (+ 6)	468 (+ 301)	133 (+ 172)	11	133 (+ 172)	7	28
Aug.	116 (+ 229)	13 (+ 51)	2 (+ 36)	0	35 (+ 27)	4 (+ 8)	1,085 (+ 835)	118 (+ 232)	13	118 (+ 232)	5	11
Sept.	44 (- <sup>a</sup> )	44 (-)	0	0	16 (-)	16 (-)	397 (-)	397 (-)	16	397 (-)	53	100
						Total	2,038 (+ 712)	648 (+ 237)	13	648 (+ 237)	12	28

\* 95% C.L. = 95% confidence limits.  
a No confidence limits, only one sample taken.

TABLE 4-28

Estimated Catch Per Unit Effort (CPUE) and Harvest Per  
Unit Effort (HPUE) Summary for the Similkameen River  
Above Similkameen Falls

	Weekends		Weekdays		Monthly	
	Mean Daily CPUE fish/hr. (95% C.L.)*	Mean Daily HPUE fish/hr. (95% C.L.)	Mean Daily CPUE fish/hr. (95% C.L.)	Mean Daily HPUE fish/hr. (95% C.L.)	Mean Daily CPUE fish/hr. (95% C.L.)	Mean Daily HPUE fish/hr. (95% C.L.)
June	0	0	1.4 (+ 1.6)	0	1.0 (+ 2.1)	0
July	0.5 (+ 1.2)	0.2 (+ 1.2)	0.8 (+ 2.4)	0.1 (+ 0.3)	0.7 (+ 0.6)	0.1 (+ 0.1)
Aug.	2.0 (+ 3.5)	0.2 (+ 0.8)	0.1 (+ 0.9)	0	0.6 (+ 0.4)	0.1 (+ 0.1)
Sept.	1.1 (-) <sup>a</sup>	1.1 (-)	0 (-)	0 (-)	0.4 (-)	0.4 (-)

\* 95% C.L. = 95% confidence limits.

a No confidence limits, only one sample.



**TABLE 4-29**  
**Estimated Catch and Harvest Summary for the Similkameen River**  
**Between Old Hedley Rd. Bridge and Princeton**

	Weekends			Weekdays			Monthly			Monthly		
	Mean Daily Catch (95% C.L.)*	Mean Daily Harvest (95% C.L.)	Mean Daily Catch (95% C.L.)	Mean Daily Harvest (95% C.L.)	Mean Daily Catch (95% C.L.)	Mean Daily Harvest (95% C.L.)	Total Catch (95% C.L.)	% of System Total	Total Harvest (95% C.L.)	% of System Total	% of Total Catch Harvested	
June	- <sup>a</sup>	-	-	-	-	-	-	0	-	0	-	
July	28 (+ 141)	14 (+ 57)	7 (+ 45)	7 (+ 45)	14 (+ 18)	9 (+ 13)	431 (+ 569)	10	288 (+ 394)	15	67	
Aug.	22 (+ 86)	10 (+ 45)	10 (+ 62)	0	13 (+ 18)	3 (+ 5)	409 (+ 561)	5	87 (+ 144)	4	21	
Sept.	0	0	0	0	0	0	0	0	0	0	0	
						Total	840 (+ 700)	5	375 (+ 368)	7	45	

\* 95% C.L. = 95% confidence limits.  
a = No fishing pressure occurred.

TABLE 4-30  
Estimated Catch Per Unit Effort (CPUE) and Harvest Per  
Unit Effort (HPUE) Summary for the Similkameen River  
Between Old Hedley Rd. Bridge and Princeton

	Weekends		Weekdays		Monthly	
	Mean Daily CPUE fish/hr. (95% C.L.)*	Mean Daily HPUE fish/hr. (95% C.L.)	Mean Daily CPUE fish/hr. (95% C.L.)	Mean Daily HPUE fish/hr. (95% C.L.)	Mean Daily CPUE fish/hr. (95% C.L.)	Mean Daily HPUE fish/hr. (95% C.L.)
June	1	-	-	-	-	-
July	0.5 (+ 1.9)	0.3 (+ 12.6)	0.7 (+ 0.9)	0.7 (+ 12.6)	0.6 (+ 1.4)	0.6 (+ 1.3)
Aug.	0.4 (+ 1.6)	0.3 (+ 1.6)	0.3 (+ 2.1)	0	0.4 (+ 0.6)	0.1 (+ 0.2)
Sept.	0	0	0	0	0	0

\* 95% C.L. = 95% Confidence Limits.  
1 No fishing pressure occurred

**TABLE 4-31**  
**Estimated Catch and Harvest Summary for the Similkameen River**  
**Between Canada/U.S. Border and Keremeos**

	Weekends			Weekdays			Monthly			Monthly		
	Mean Daily Catch (95% C.L.)*	Mean Daily Harvest (95% C.L.)	Mean Daily Catch (95% C.L.)	Mean Daily Harvest (95% C.L.)	Mean Daily Catch (95% C.L.)	Mean Daily Harvest (95% C.L.)	Total Catch (95% C.L.)	% of System Total	Total Harvest (95% C.L.)	% of System Total	% of Total Catch Harvested	
June	- <sup>a</sup>	-	-	-	-	-	-	0	-	0	-	
July	-	-	-	-	-	-	-	0	-	0	-	
Aug.	0	0	1 (+10)	1 (+10)	1 (+4)	1 (+4)	30 (+120)	1	30 (+120)	1	100	
Sept.	-	-	-	-	-	-	-	0	-	0	-	
						Total	30 (+120)	0	30 (+120)	1	100	

\* 95% C.L. = 95% confidence limits.

<sup>a</sup> No fishing pressure occurred.

TABLE 4-32  
Estimated Catch and Harvest Summary for the Similkameen River  
Between Keremeos and Old Hedley Rd. Bridge

	Weekends			Weekdays			Monthly			Monthly		
	Mean Daily Catch (95% C.L.)*	Mean Daily Harvest (95% C.L.)	Mean Daily Catch (95% C.L.)	Mean Daily Harvest (95% C.L.)	Mean Daily Catch (95% C.L.)	Mean Daily Harvest (95% C.L.)	Total Catch (95% C.L.)	% of System Total	Total Harvest (95% C.L.)	% of System Total	% of Total Catch Harvested	
June	- <sup>a</sup>	-	-	-	-	-	-	0	-	0	-	
July	6 (+ 108)	6 (+ 108)	1 (+ 10)	1 (+ 10)	3 (+ 6)	3 (+ 6)	87 (+ 187)	2	87 (+ 187)	4	100	
Aug.	0	0	N.S.	N.S.	0	0	0	-	0	0	0	
Sept.	-	-	-	-	-	-	-	-	-	0	-	
						Total	87 (+ 151)	1	87 (+ 151)	2	100	

\* 95% C.L. = 95% confidence limits.

a = No fishing pressure occurred.

N.S. = Not sampled.

TABLE 4-33  
Estimated Catch Per Unit Effort (CPUE) and Harvest Per  
Unit Effort (HPUE) Summary for the Similkameen River  
Between the Canada/U.S. Border and Keremeos

	Weekends		Weekdays		Monthly	
	Mean Daily CPUE fish/hr. (95% C.L.)*	Mean Daily HPUE fish/hr. (95% C.L.)	Mean Daily CPUE fish/hr. (95% C.L.)	Mean Daily HPUE fish/hr. (95% C.L.)	Mean Daily CPUE fish/hr. (95% C.L.)	Mean Daily HPUE fish/hr. (95% C.L.)
June	1	-	-	-	-	-
July	-	-	-	-	-	-
Aug.	0	0	0.1 (+ 0.5)	0.1 (+ 0.5)	0.1 (+ 0.2)	0.1 (+ 0.2)
Sept.	-	-	-	-	-	-

\* 95% C.L. = 95% Confidence Limits.  
1 No fishing pressure occurred.

TABLE 4-34  
Estimated Catch Per Unit Effort (CPUE) and Harvest Per  
Unit Effort (HPUE) Summary for the Similkameen River  
Between Keremeos and Old Hedley Rd. Bridge

	Weekends		Weekdays			Monthly	
	Mean Daily CPUE fish/hr. (95% C.L.)*	Mean Daily HPUE fish/hr. (95% C.L.)	Mean Daily CPUE fish/hr. (95% C.L.)	Mean Daily HPUE fish/hr. (95% C.L.)	Mean Daily CPUE fish/hr. (95% C.L.)	Mean Daily HPUE fish/hr. (95% C.L.)	
June	1 -	-	-	-	-	-	-
July	0.8 -	0.8 -	0.1 (+ 1.8)	0.1 (+ 1.8)	0.3 (+ 0.3)	0.3 (+ 0.3)	
Aug.	0	0	N.S. <sup>2</sup>	N.S.	0	0	
Sept.	-	-	-	-	-	-	

\* 95% C.L. = 95% Confidence Limits.

1 No fishing pressure occurred

2 N.S. = Not sampled

TABLE 4-35  
Estimated Catch and Harvest Summary  
for the Tulameen River

	Weekends			Weekdays			Monthly			Monthly		
	Mean Daily Catch (95% C.L.)*	Mean Daily Harvest (95% C.L.)	Mean Daily Catch (95% C.L.)	Mean Daily Harvest (95% C.L.)	Mean Daily Catch (95% C.L.)	Mean Daily Harvest (95% C.L.)	Total Catch (95% C.L.)	% of System Total	Total Harvest (95% C.L.)	% of System Total	Total Catch (95% C.L.)	% of Total Catch Harvested
June	- <sup>a</sup>	-	-	-	-	-	-	0	-	0	-	-
July	0	0	8 (+ 144)	0	5 (+ 24)	0	168 (+ 734)	4	0	0	0	0
Aug.	0	0	7 (+ 41)	7 (+ 43)	5 (+ 12)	5 (+ 12)	161 (+ 365)	2	149 (+ 375)	6	-	93
Sept.	-	-	-	-	-	-	-	0	-	0	-	-
						Total	329 (+ 529)	2	149 (+ 303)	3		45

\* 95% C.L. = 95% confidence limits.  
a = No fishing pressure occurred.

TABLE 4-36  
Estimated Catch Per Unit Effort (CPUE) and Harvest Per  
Unit Effort (HPUE) Summary for the Tulameen River

	Weekends		Weekdays		Monthly	
	Mean Daily CPUE fish/hr. (95% C.L.)*	Mean Daily HPUE fish/hr. (95% C.L.)	Mean Daily CPUE fish/hr. (95% C.L.)	Mean Daily HPUE fish/hr. (95% C.L.)	Mean Daily CPUE fish/hr. (95% C.L.)	Mean Daily HPUE fish/hr. (95% C.L.)
June	1	-	-	-	-	-
July	0	0	0.8 (-) <sup>2</sup>	0	0.5 (-)	0
Aug.	0	0	0.4 (+ 0)	0.3 (+ 1.8)	0.3 (+ 0)	0.2 (+ 0.9)
Sept.	-	-	-	-	-	-

\* 95% C.L. = 95% Confidence Limits.

1 No fishing pressure occurred

2 No confidence limits, only one sample



TABLE 4-37  
 Anglers Using Various Fishing Methods During the 1984  
 Similkameen River Creel Census

Fishing Method	No. of Angler				Total	%
	June	July	Aug	Sept		
Lure	2	17	40	2	61	18
Fly	8	38	51	8	105	31
Bait	<u>24</u>	<u>54</u>	<u>59</u>	<u>33</u>	<u>170</u>	<u>51</u>
Total	34	109	150	43	336	100

TABLE 4-38  
Summary of Similkameen River System Catch  
by Method, June-September, 1984

WEEKENDS

Fishing Method	June					July								
	Fish Species					Fish Species								
	Rb	Bk	Wf	Ct	Other	Total	%	Rb	Bk	Wf	Ct	Other	Total	%
Lure	0	0	0	0	0	0	0	1	0	0	0	0	1	1
Fly	12	28	0	0	0	40	61	18	4	4	0	0	26	38
Bait	<u>10</u>	<u>16</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>26</u>	<u>39</u>	<u>35</u>	<u>5</u>	<u>1</u>	<u>1</u>	<u>0</u>	<u>42</u>	<u>61</u>
Total	22	44	0	0	0	66	100	54	9	5	1	0	69	100

Fishing Method	August					September								
	Fish Species					Fish Species								
	Rb	Bk	Wf	Ct	Other	Total	%	Rb	Bk	Wf	Ct	Other	Total	%
Lure	122	0	0	0	6	128	47	0	3	0	0	0	3	4
Fly	6	0	2	0	0	66	24	0	1	0	0	0	1	1
Bait	<u>7</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>76</u>	<u>29</u>	<u>10</u>	<u>53</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>63</u>	<u>94</u>
Total	262	0	2	0	6	270	100	10	57	0	0	0	67	99

TABLE 4-38 (Continued)  
Summary of Similkameen River System Catch  
by Method, June-September, 1984

WEEKDAYS

Fishing Method	June					July								
	Fish Species I					Fish Species								
	Rb	Bk	Wf	Ct	Other	Total	%	Rb	Bk	Wf	Ct	Other	Total	%
Lure	0	0	0	0	0	0	0	3	1	0	0	0	4	4
Fly	1	0	0	0	0	1	10	35	3	0	0	0	38	43
Bait	<u>7</u>	<u>0</u>	<u>2</u>	<u>0</u>	<u>0</u>	<u>9</u>	<u>90</u>	<u>31</u>	<u>15</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>47</u>	<u>53</u>
Total	8	0	2	0	0	10	100	69	19	0	0	1	89	100

Fishing Method	August Fish Species†						September Fish Species							
	Rb	Bk	Wf	Ct	Other	Total	%	Rb	Bk	Wf	Ct	Other	Total	%
Lure	25	0	0	0	0	25	42	0	0	0	0	0	0	0
Fly	19	0	0	0	0	19	32	0	0	0	0	0	0	0
Bait	<u>6</u>	<u>2</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>16</u>	<u>27</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	50	9	1	0	0	60	101	0	0	0	0	0	0	0

<sup>1</sup> Rb = rainbow trout, Bk = brook trout, Wf = mountain whitefish, Ct = cutthroat trout

TABLE 4-39  
Mean Angler Catch (Success) by Method

	WEEKEND				WEEKDAY			
	Angler Success (fish/angler)				Angler Success (fish/angler)			
	June	July	Aug	Sept	June	July	Aug	Sept
Lure	0	0.1	8.5	3.0	0	0.4	1.0	0
Fly	8.0	1.4	2.2	0.1	0.3	1.9	0.9	0
Bait	1.2	1.7	2.1	1.9	3.0	1.6	0.7	0

**TABLE 4-40**  
**Mean Fork Length and Weight of Rainbow Trout**  
**in the Similkameen River System**

a) Similkameen River System: actual Measured mean lengths and weights

Age Class	n	Mean Fork Length (mm)	S.D.	Length Range (mm)	n	Mean Weight (g)	S.D.	Weight Range (g)
2+	1	130.0	-	130.0	1	20.0	-	20.0
3+	29	174.7	14.7	138.0-207.0	17	54.1	18.1	20.0-99.0
4+	24	216.4	24.4	175.0-262.0	12	103.1	30.2	62.0-127.0
5+	3	247.3	15.5	230.0-260.0	2	150.6	3.7	148.0-153.2
6+	1	300.0	-	300.0	-	-	-	-

b) Similkameen River System: mean back calculated lengths

Age Class	n	Mean Fork Length (mm)	S.D.	Length Range (mm)
1	57	67.1	15.6	36.4-108.5
2	56	130.6	23.9	72.2-185.5
3	27	182.2	30.3	101.3-249.2
4	3	212.2	25.2	186.9-237.3
5	1	265.8	-	265.8

TABLE 4-40 (Continued)  
Mean Fork Length and Weight of Rainbow Trout  
in the Similkameen River System

c) Similkameen River above the Falls: actual lengths and weights

Age Class	n	Mean Fork Length (mm)	S.D.	Length Range (mm)	n	Mean Weight (g)	S.D.	Weight Range (g)
2+	0	-	-	-	0	-	-	-
3+	12	179.9	9.8	167.0-197.0	9	55.0	12.1	42.8-75.0
4+	1	210.0	-	-	1	82.0	-	-
5+	0	-	-	-	0	-	-	-

d) Similkameen River below the Falls: actual lengths and weights

Age Class	n	Mean Fork Length (mm)	S.D.	Length Range (mm)	n	Mean Weight (g)	S.D.	Weight Range (g)
2+	0	-	-	-	0	-	-	-
3+	0	-	-	-	0	-	-	-
4+	8	216.6	25.8	182.0-262.0	4	106.7	43.9	70.5-167.0
5+	2	241.0	15.6	230.0-252.0	1	153.2	-	-
6+	1	300.0	-	300.0	0	-	-	-

TABLE 4-40 (Continued)  
Mean Fork Length and Weight of Rainbow Trout  
in the Similkameen River System

e) Ashnola River: actual lengths and weights

Age Class	n	Mean Fork Length (mm)	S.D.	Length Range (mm)	n	Mean Weight (g)	S.D.	Weight Range (g)
2+	1	130.0	-	-	1	20.0	-	-
3+	15	167.6	14.1	138.0-195.0	6	42.8	14.4	20.0-60.0
4+	12	220.4	26.1	175.0-255.0	4	115.5	21.4	87.0-136.0
5+	1	260.0	-	260.0	1	148.0	-	148.0

f) Summers and Allison Creeks: actual lengths and weights

Age Class	n	Mean Fork Length (mm)	S.D.	Length Range (mm)	n	Mean Weight (g)	S.D.	Weight Range (g)
2+	0	-	-	-	0	-	-	-
3+	2	196.0	15.6	185.0-207.0	2	84.3	20.8	69.6-99.0
4+	3	201.3	16.8	182.0-212.0	3	89.0	23.9	62.0-107.5
5+	0	-	-	-	0	-	-	-

TABLE 4-41  
Mean Fork Length and Weight of Brook Trout Caught  
in Summers and Allison Creeks

Age Class	n	Mean Fork Length (mm)	S.D.	Length Range (mm)	Mean Weight (g)	S.D.	Weight Range (g)
2+	4	181.0	11.0	171.0-196.0	68.3	14.3	55.8-88.9
3+	1	198.0	-	198.0	88.4	-	88.4

TABLE 4-42  
Mean Fork Length and Weights of Mountain Whitefish Caught  
in the Similkameen River System

Age Class	n	Mean Fork Length (mm)	S.D.	Length Range (mm)
4+/3+ <sup>a</sup>	2	289.5	7.8	284.0-295.0
5+/4+	2	325.0	7.1	320.0-330.0

<sup>a</sup> Best estimate of age shown first.



TABLE 4-43  
Summary of Angler Opinion on Steelhead Trout Introduction

Date	For Steelhead Introduction	Against Steelhead Introduction	Undecided
June	31	0	3
July	93	4	12
Aug.	139	1	10
Sept.	<u>31</u>	<u>6</u>	<u>6</u>
Total	294 (88%)	11 (3%)	31 (9%)

TABLE 4-44

Summary of Answers to the Question:  
 Would You Make a Special Trip To The Similkameen River System  
 To Fish For Steelhead Trout, If So For How Long?

Date	Special Trip to System?			If Yes, How Long Would You Spend Fishing?					
	Yes	No	Undecided	0-2 (hrs.)	2-5 (hrs.)	5-10 (hrs.)	1 (day)	Weekend 3-7 (days)	1 (week)
June	20	14	0	4	-	-	4	12	-
July	38	67	4	2	-	6	13	9	5
Aug.	93	50	7	-	4	3	19	48	10
Sept.	<u>13</u>	<u>30</u>	<u>0</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>6</u>	<u>7</u>	<u>-</u>
Total	164	161	11	6	4	9	42	76	15

TABLE 4-45

## Summary of Answers to the Question:

If You Wouldn't Make a Special Trip to Fish For Steelhead Trout, Would You Spend More Time Fishing on a Trip Such as This, Knowing Steelhead Trout, Were in the River?

Date	No Special Trip, but More Time Fishing			If Yes, How Much Longer?					3-7 (days)	1 (week)
	Yes	No	Undecided	0-2 (hrs.)	2-5 (hrs.)	5-10 (hrs.)	1 (day)	Weekend		
June	4	10	0	2	-	-	-	-	2	-
July	27	38	6	10	6	-	5	4	-	2
Aug.	37	20	0	17	2	2	8	3	5	-
Sept.	<u>5</u>	<u>22</u>	<u>3</u>	<u>1</u>	<u>3</u>	<u>2</u>	<u>1</u>	<u>2</u>	<u>2</u>	<u>2</u>
Total	73	90	9	30	11	2	14	7	7	2

1) Date: \_\_\_\_\_  
1) Jan 3) Mar 5) May 7) July 9) Sept 11) Nov  
2) Feb 4) Apr 6) Jun 8) Aug 10) Oct 12) Dec

2) Time: \_\_\_\_\_

3) Weather:  
1) clear 4) raining  
2) less than 50% overcast 5) snowing  
3) greater than 50% overcast

4) Water Clarity:  
1) 0 2) 1+ 3) Other \_\_\_\_\_

5) No. of Anglers \_\_\_\_\_

6) Location:  
1) Section 1 \_\_\_\_\_  
2) Section 2 \_\_\_\_\_  
3) Section 3 \_\_\_\_\_  
4) Section 4 \_\_\_\_\_  
5) Section 5 \_\_\_\_\_  
6) Section 6 \_\_\_\_\_  
7) Section 7 \_\_\_\_\_  
8) Section 8 \_\_\_\_\_  
9) Section 9 \_\_\_\_\_

7) Anglers's Residence:  
1) Local \_\_\_\_\_  
2) B.C. \_\_\_\_\_  
3) Canada \_\_\_\_\_  
4) Foreign \_\_\_\_\_

8) Time started fishing:  
1) early morning 4) early afternoon  
2) mid morning 5) late afternoon  
3) noon 6) early evening

9) Total time fished:  
1) 0.5 hr 4) 2 hr 7) 5 hr 10) 8 hr  
2) 1 hr 5) 3 hr 8) 6 hr 11) 9 hr  
3) 1.5 hr 6) 4 hr 9) 7 hr 12) 10+ hr

10) Fishing trip completed:  
1) Yes 2) No

1) Was the main purpose of your trip to fish:  
1) Yes 2) No

2) Fishing gear:  
1) Lure 3) Bait  
2) Fly 4) Other \_\_\_\_\_

3) What was the main species you fished for today:  
1) Rainbow trout 3) Whitefish 4) Other \_\_\_\_\_  
2) Brook trout 4) Cutthroat

14) No. fish caught of each species:

a) Rainbow trout \_\_\_\_\_

b) Brook trout \_\_\_\_\_

c) Whitefish \_\_\_\_\_

d) Cutthroat \_\_\_\_\_

e) Other \_\_\_\_\_

15) No. fish kept of each species:

a) Rainbow trout \_\_\_\_\_

b) Brook trout \_\_\_\_\_

c) Whitefish \_\_\_\_\_

d) Cutthroat \_\_\_\_\_

e) Other \_\_\_\_\_

16) a) If steelhead trout were introduced into the Similkameen River system would you make a special trip to the river system just to fish: \_\_\_\_\_

1) Yes

2) No

3) Don't know

b) If so, for how long: \_\_\_\_\_

1) 0-2 hrs

3) 5-10 hrs

5) Weekend

7) 1 Week

2) 2-5 hrs

4) 1 day

6) 3-7 days

17) a) If you wouldn't make a special trip just to fish, would you spend more time fishing, than you are now, on a trip such as this: \_\_\_\_\_

1) Yes

2) No

3) Don't know

b) If so, for how long: \_\_\_\_\_

1) 0-2 hrs

3) 5-10 hrs

5) Weekend

7) 1 Week

2) 2-5 hrs

4) 1 day

6) 3-7 days

18) We are working towards introducing steelhead trout into the Similkameen system, do you have any comments? \_\_\_\_\_

1) For

3) Undecided

2) Against

Comments:

19)

Species	Length (mm)	Weight (gm)	Scale No.

Creel Clerk \_\_\_\_\_

### Age, Length and Weight of Rainbow Trout Caught in the Similkameen River System During the 1984 Creel Census

[illegible]

APPENDIX 2 (Continued)

Age, Length and Weight of Rainbow Trout Caught in the Similkameen  
River System During the 1984 Creel Census

Scale No.	Comments	Age	Length (cm)	Weight (gm)	Max. Radius	SCALE MEASUREMENTS					BACK CALCULATION				
						Annuli					Fish Length (cm)				
						1	2	3	4	5	1	2	3	4	5
Similkameen River Below Similkameen Falls															
env 9		4+	26.2	167	.85	.28	.50	.69			8.68059	15.4118	21.2682		
X 19/20		4+	22.5		.70	.15	.38	.51			4.82143	12.2143	16.2435		
X 23/24		4+	20		.89	.20	.50	.68			4.49438	11.2360	15.879		
X 25/26		4+	20.2		.80	.20	.30	.68			5.05	7.575	10.1287		
X 27/28		6+	30		1.58	.20	.38	.89	1.25	1.4	3.79747	7.21519	16.8987	23.7342	
26.582															
A 30/31		4+	22.2	111	.78	.29	.55	.7			8.25385	15.6538	19.9231		
A 32/33		4+	18.2	70.5	.71	.27	.54	.65			6.92113	13.8423	16.6620		
A 35/36		5+	25.2	153.2	.89	.19	.38	.55	.75		5.37978	10.7596	15.5730	21.2360	
A 37/38		4+	20	78.2	.78	.20	.49	.69			5.12821	12.5641	17.6923		
X 29/30	good growth	4+	24		.81	.26	.48	.7			7.70370	14.2222	20.7407		
X 31/32		5+	23		.96	.21	.60	.69	.78		5.03125	14.375	16.5313	18.6875	
Ashnola River															
env 5		3+	16.4	37	.41	.20	.30				8	12			
Y 1/2	some resorption	4+	21		.80	.25	.38	.72			6.5625	9.975	18.9		
Y 7/8		4+	21		.75	.25	.42	.69			7.0000	11.76	19.32		
Y 3/4		4+	25.5		.80	.28	.50	.7			8.925	15.9375	22.3125		
Y 5/6		4+	25.5		.88	.30	.64	.86			8.69318	18.5455	24.9205		
Y 9/10		4+	20.5		.70	.17	.40	.65			4.97857	11.7143	19.0357		

# APPENDIX 2 (Continued)

## Age, Length and Weight of Brook Trout Caught in Summers and Allison Creeks During the 1984 Creel Census

No.	Comments	Age	Length (cm)	Weight (gm)	Max. Radius	Scale Measurements				
						Annuli				
						1	2	3	4	5
A 3/4		2+	17.5	65.5	.50	.26	.42			
A 7/8	scales poor	2+	18.2	63	.60	.21	.43			
A 9/10		2+	17.1	55.8	.85	.28	.59			
A 13/14	scales resorbed		17	60.8						
A 17/18	scales resorbed		16.9	55						
A 19/20		3+	19.8	88.4	.38	.16	.25	.36		
A 23/24		2+	19.6	88.9	.38	.15	.28			
A 25/26	scales resorbed		19.5	80						



**LOWERY**

**LOWERY**

# APPENDIX 2 (Continued)

## Age, Length and Weight of Rainbow Trout Caught in the Similkameen River System During the 1984 Creel Census

Scale No.	Comments	Age	Length (cm)	Weight (gm)	Max. Radius	SCALE MEASUREMENTS									
						Annuli					BACK CALCULATION				
						1	2	3	4	5	1	2	3	4	5
<u>Ashnola River (Continued)</u>															
X 13/14		3+	17	42	.66	.26	.49				6.69697	12.6212			
X 15/16		3+	18.4	56.5	.55	.20	.48				6.69091	16.0582			
A 1/2		3+	17		.62	.28	.50				7.67742	13.7097			
X 17/18	good growth	4+	24.5		.90	.26	.49	.71			7.07778	13.3389	19.3278		
X 44/45		4+	23.6	127	.62	.16	.35	.6			6.09032	13.3226	22.8387		
X 46/47	scales resorbed		15.5												
X 49/50	good growth	5+	26	148	1.20	.20	.55	.7	.9						
<u>Summers and Allison Creeks</u>															
env b1	scales resorbed		20.9	92.5											
env b2			21.2	97.4											
A 5/6	scales resorbed	4+	18.2	57	.69	.17	.28	.55			5.22319	8.60290	16.8986		
A 11/12		4+	18.2	62	.90	.18	.51	.76			3.64	10.3133	15.3689		
A 15/16	scales resorbed		20	75.5											
A 21/22		3+	18.5	69.6	.63	.20	.52				5.87302	15.2698			
X 37/38		4+	21	107.5	.99	.24	.48	.75			5.09091	10.1818	15.9091		
X 39/40	good growth	3+	20.7	99	.77	.23	.48				6.18312	12.9039			

# APPENDIX 2 (Continued)

Age, Length and Weight of Mountain Whitefish Caught in the Similkameen River System During the 1984 Creel Census

No.	Comments	Age	Length (cm)	Weight (gm)	Max. Radius	Scale Measurements				
						Annuli				
						1	2	3	4	5
A 39/40 <sup>1</sup>		4+/3+ <sup>3</sup>	28.4	268.2	3.90	.50	1.25	2.40	2.80	
Z 1-4 <sup>1</sup>		5+/4+	32		4.30	.61	1.50	2.20	2.70	3.00
Z 5-8 <sup>2</sup>		4+/3+	29.5		4.10	.50	1.35	2.25	2.60	
Z 9-14 <sup>1</sup>		5+/4+	33	295	3.70	.50	1.30	1.80	2.25	2.55

1 - Caught in the Similkameen River below the falls.

2 - Caught in the Ashnola River.

3 - Ages are estimates, best estimate shown first.



APPENDIX 3

1984 Disease Analysis  
and Related Correspondence





File: 0440

October 11, 1984

Dr. Don Chapman  
Box AL  
McCall, Idaho  
U.S.A. 83638

OCT 26 1984  
BEAK CONSULTANTS

Dear Don:

Re: Similkameen River Proposal

I am enclosing more than you ever wanted to know about Canadian fish health regulations: The Manual of Compliance for Fish Health Protection Regulations. In addition, I can offer some guidance on a quarantine system and our certification process.

We have discussed the specific Wells' situation with Mr. Terry Shortt, who is in charge of the National Registry of Fish Diseases in Ottawa. It appears that a quarantine section of the Wells Hatchery on groundwater could be certified within an 18 month period involving four disease tests per the following schedule:

- a) Test one is the stock of juveniles on hand in the fall (presumably these would be the same stock to be used in the transplant);
- b) Test two is of the adult stock at time of egg take. (This would be a transfer of uncertified stock to the facility which would normally cancel the certification program. However, adult steelhead are considered wild stock so a test of donors should qualify them as certified providing no disease agent (Schedule II), are present);
- c) Test three is the juvenile stock in the fall;
- d) Test four is the smolts in the spring.

Since Wells Hatchery is on groundwater, it would not be necessary to build a completely new section to the facility. It is only the hatching and growing area that must be quarantined in terms of separate water and equipment. Incubation and perhaps early rearing should be done by families on separate water supplies. With this separation the eggs of diseased parents can be destroyed.

. . . /2

Dr. Don Chapman

-2-

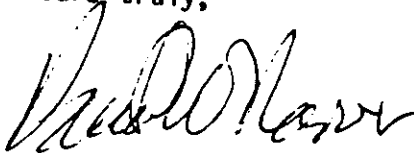
Oct. 11, 1984

Your question of adult returns to a trap and truck facility at Enloe Dam is well taken. However, the returning adult steelhead can be considered as wild fish and thus can be allowed to swim freely into Canada or be trucked in for restocking.

Clearly the Canadian fish health concerns are going to be a major impediment to rapid progress in the Enloe-Similkameen proposal. The proposal is going to receive strong support from Canada only if there are major benefits for Canadians. As I have said several times, these benefits must be in the form of adult steelhead available for Canadian anglers in October. If such returns can be demonstrated, then we would be prepared to consider taking some disease risk in terms of permitting the import of Wells' smolts and adult returns.

Such a demonstration is underway this fall and next when adult returns are to be expected from 1983 and 1984 liberations of about 200,000 smolts below Enloe Dam. Snorkle surveys in September through November followed by spring assessments will reveal whether the adults entered the Similkameen in the fall or spring. To date surveys in mid-September and early October have revealed no steelhead. This information will guide our hand. In the meantime, I suggest the best course is to wait.

Yours truly,



David W. Narver  
A/Manager  
Recreational Fisheries

DWN/jl

Attachment

cc/ L. Everson

Dr. G. Bouck

G. Hoskins

R.A.H. Sparrow

L.A. Sunde

C. Bull





RESEARCH LABORATORIES, INC.

November 20, 1984

RECEIVED  
NOV 30 1984

BEAK CONSULTANTS

Dwight G. Hickey  
Fisheries Biologist  
Leader, Fisheries Group  
IEC Beak Consultants, Ltd.  
10751 Shell Bridge Way  
Suite 120  
Richmond, B.C.  
Canada V6X 2W8

Subject: Examination of 52 adult spawned chinook for  
presence of:

Aeromonas salmonicida  
Yersinia ruckeri  
Renibacterium salmoninarum  
Ceratomyxa shasta

and the Proliferative Kidney Disease Etiologic Agent

Methods:

Due to short notice (order received to do work Friday 10/26/84 -fish received beginning 10/28/84) the methods chosen to do the work were culture oriented and not IFAT or FAT oriented. Culture methods are considered less sensitive. Fish were received packed in ice in ice chests. In most cases the fish had been dead for at least twenty four hours before arriving in the laboratory. All organs were examined grossly for obvious symptoms of disease. Particular attention was paid to the kidneys. Kidney imprints were stained with methylene blue to stain the PKD organism and gram stained. After the first twenty fish were examined, it became apparant that gram stains of liver imprints were also necessary. Additionally, acetone fixed kidney imprints were prepared. All fish were sampled by streaking kidney and liver tissue onto TSA. For the first twenty fish, kidney tissue was also struck onto Evelyns KDM<sub>2</sub> media. Wet mounts of gall bladder fluid from all tish were examined for C. shasta. Tissue samples (kidney, spleen and liver) were placed into 10% phosphate buffered formalin for possible future histopathology. Tissue samples (spleen and kidney) were also removed and trasported to National Fish Health Laboratory for IPN/IHN analysis.

Results:

All 52 fish had high levels of bacteria in kidneys and livers. The levels were so high that the KDM<sub>2</sub> plates were completely overgrown with non R. salmoninarum. For this reason, kidney smears (in quadruplicate) were prepared, acetone fixed, and stored at 0°C for possible future FAT or IFAT. No A. salmonicida (differentiated by pigment production) were detected in any of the fish. All colonies were screened for oxidase activity; those that were oxidase negative and that showed colony morphologies possibly indicative of Y. ruckeri were gram stained and serotyped. No Y. ruckeri were found. The predominant microorganisms isolated were Aeromonas hydrophila spp, misc. Pseudomonads, misc. Vibrios, as well as assorted gram positive cocci. Sixty two percent of the fish had Ceratomyxa shasta infections, ranging from light to heavy, in gall bladders.

No symptoms of KD or PKD were apparant from gross examinations of kidney tissue. In fact, the kidneys, for the most part, appeared in excellent shape. Examination of methylene blue stains failed to reveal any evidence of PKD though some myxo-sporidans were present. Since PKD autolyzes very rapidly after death -it is thought that visible evidence of the parasite is gone 6-12 hours post mortem, FAT or IFAT techniques might be useful on kidney tissue. No definitive evidence of BKD was found either in kidney or liver smears. Since autolysis of kidney tissue had progressed significantly, the presence of large #'s of melanin granules masked the presence of kidney disease organisms that might be present.

The following table summarizes fish by fish the presence or absence of C. shasta.

Conclusions:

With reasonable certainty it can be stated that A. salmonicida and Y. ruckeri were not present in any of the fish examined. Only more sensitive methods such as IFAT or FAT of kidney smears could result in more accurate assessments. If they were present, they would be present in very low numbers since large numbers of other organisms were present. Greater than one half of the fish had Ceratomyxa shasta infestations. Approximately 20% of the fish also had Anisakis infestations. Results of the BKD analysis were not clear cut; based upon the complete absence of overt pathology in the kidney, the absence of lesions and the presence of high numbers of other microorganisms, this suggests that very low levels of the organism were present, if present at all. Again, IFAT or FAT might be a future method of choice. Since significant post mortem degeneration of the kidney had occurred, presumably significant autolysis of the PKD organism had also taken place. IFAT or FAT on freshly prepared kidney smears should be a future method of choice. We have 4 acetone fixed slides from kidney smears from each of the last 30 fish examined. Should you desire additional analyses, such as IFAT or FAT these slides are particularly suited for BKD analyses. Histopathology, though of doubtful value primarily due to post mortem degeneration, can also be done on liver, kidney and spleen tissue. Virological results will be forthcoming.

If you have any questions or comments please don't hesitate to contact us.

Sincerely,



Stephen G. Newman, Ph.D.  
Director of Microbiology Research  
and Development

SGN/ja

TABLE I

Ceratomyxa shasta infestations by fish #

<u>Our#</u>	<u>Your#</u>	<u>Sex</u>	<u>C.S.</u>
1	8	F	- 1
2	5	F	+ 2
3	4	F	+ 3
4	6	F	+
5	9	F	+
6	7	F	+
7	10	M	-
8	2	M	-
9	1	F	+
10	3	M	-
11	12	F	-
12	16	F	+
13	20	F	+
14	13	F	+
15	11	F	+
16	19	F	+
17	21	F	+
18	17	F	-
19	14	F	+
20	18	F	+
21	15	F	+
22	29	F	-
23	24	F	+
24	25	F	+
25	22	F	-
26	23	F	+
27	27	F	+
28	31	F	-
29	30	F	+
30	28	F	-
31	26	F	-
32	38	F	+
33	33	F	+
34	32	F	-
35	34	M (Jack)	+
36	35	M	+
37	46	F	-
38	41	F	-
39	37	F	-
40	40	F	+
41	43	M	+
42	42	M	-

TABLE I

Ceratomyxa shasta infestations by fish #

<u>Our#</u>	<u>Your#</u>	<u>Sex</u>	<u>C.S.</u>
43	45	F	-
44	44	F	+
45	37	F	+
46	48	M	+
47	47	F	-
48	50	M	-
49	36	M	+
50	51	F	+
51	52	M	-
52	49	M	+

<sup>1</sup> Negative (40+ fields examined)

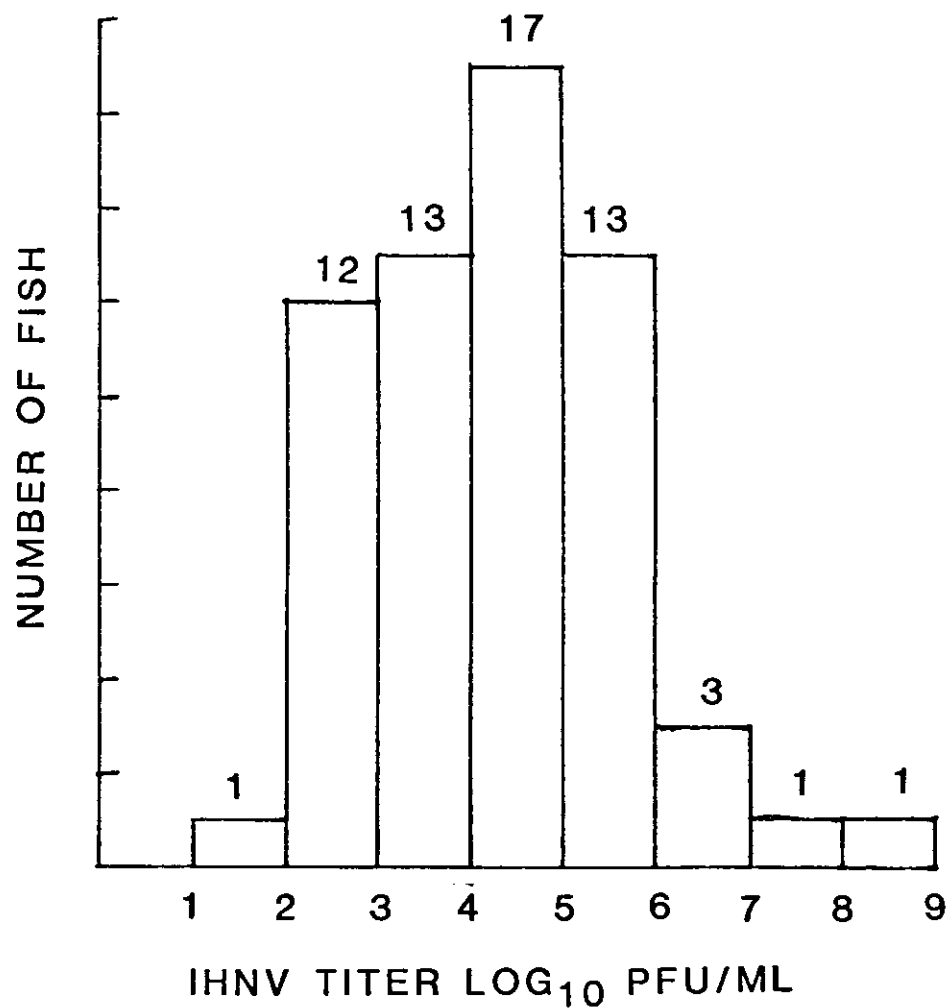
<sup>2</sup> Weak (low numbers found)

<sup>3</sup> High (heavy infestations)



# IHN VIRUS TITER DISTRIBUTION

OKANAGAN  
SIMILKAMEEN RIVER  
SOCKEYE SALMON BY 1984





National Fishery Research Center - Seattle  
Bldg. 204, Naval Station  
Seattle, Washington 98115

December 13, 1984

✓ Dr. Dwight G. Hickey  
IEC Beak Consultants, Ltd.  
10751 Shellbridge Way  
Suite 120  
Richmond, British Columbia  
V6X 2W8  
CANADA

Reference: Your 3711.1A

Dear Dr. Hickey,

At the request of your firm and of Dr. Bouck of Bonneville Power Administration, we examined 65 ovarian fluid samples collected by your employees on 18 and 19 October, 1984 from sockeye salmon spawning in the ~~Similkameen~~ <sup>OKANAGAN</sup> River (upstream from Oliver). Our assay was specific for infectious hematopoietic necrosis (IHN) virus. One sample (10/18/84) was from a ripe female; the remainder of the samples were taken from spent fish. Apparently, 13 of the 22 samples taken on 18 October were inadvertently frozen in the field, however that did not appear to change the incidence or titer of the virus. The results are given with titers in plaque-forming units per ml (pfu/ml). The mean titer was calculated after a  $\log_{10}$  transformation of the raw titers.

- a. Infection rate: 93.8% (61/65)
- b. Proportion of high titers ( $10^5$  pfu/ml): 29.5% (see graph attached for titer distribution)
- c. Mean titer:  $2.1 \times 10^4$  pfu/ml

We further examined 16 ovarian fluid and 52 kidney/spleen samples from chinook salmon at the beginning of November for the presence of IHN and infectious pancreatic necrosis (IPN) viruses. The samples were delivered to us by Bio Med personnel, who got the spent carcasses from your field workers. No viruses were isolated. Because the salmon were dead when the samples were removed, we had a problem with bacterial contamination.

These results are very typical of a sockeye salmon population. As I mentioned all populations of sockeye have IHN virus. Please feel free to contact me for further information.

Sincerely,

Dan Mulcahy  
Research Virologist

cc: Ron Morinaka, BPA



Save Energy and You Serve America!






To: David W. Narver  
Director, Fisheries Branch

Date: April 16, 1985  
File: 0542

Re: Similkameen/Enlow Dam

The letter of April 2, 1985, (file 40.3004) from Chris Bull (copy attached) on the above noted subject was read with interest. Although Chris seems enthusiastic about this steelhead project I still have some concerns on technical grounds.

I am not one who believes IPN virus is universal and has escaped detection in B.C. A great many fish from the major southern drainages in B.C. have been examined by Provincial and Federal authorities without finding IPN. IHN to my knowledge has been found in fishes in association with sockeye populations in those waters. We have not found IHN in kokanee where such populations have been long isolated from sockeye. I assume fish from the Similkameen River above Enlow have been subjected to virus examinations? This last question is important since if the fish are healthy above Enlow, I do not think we should take the risk of allowing possible IPN and IHN infected fish into the B.C. portion of the river. My attitude would change if IPN already exists in the B.C. portion of the river or if IPN was in adjacent drainages.

  
R. A. H. Sparrow  
Manager  
Fish Culture Section

RAHS:ck  
Enclosure  
cc: G. D. Taylor  
C. Bull



Province of  
British Columbia

Ministry of  
Environment  
FISHERIES BRANCH

Parliament Buildings  
Victoria  
British Columbia  
V8V 1X5

Mr. M.L. Fanning  
I.E.C. Beak Consultants  
10751 Shellbridge Way  
Suite 120  
Richmond, B.C.  
V6X 2W8

April 23, 1985

Dear Len:

You should note the attached from Hugh Sparrow. I still think the biggest hurdle is proper disease surveys. I urge you to raise it with Larry.

Yours truly,

A handwritten signature in dark ink, appearing to read "D. W. Narver".

D. W. Narver,  
Director, Fisheries Branch.

Attachment



STATE OF WASHINGTON

DEPARTMENT OF GAME

1421 Anne Ave.  
East Wenatchee, WA 98801

May 1, 1985

Dwight Hickey  
IEC Beak Consultants Ltd.  
10751 Shell Bridge Way  
Suite 120  
Richmond, B.C. V6X 2W8

Dear Dwight:

Please find the enclosed summary of all virus inspections on summer steelhead at the Wells hatchery. We have isolated IPN virus from Wells summer steelhead in 1983 and 1984 at a very low incidence i.e. less than 1 %. No IPN outbreaks have ever been diagnosed at the Wells hatchery or any other Washington Department of Game hatcheries.

We haven't conducted extensive examinations for Aeromonas salmonicida, Yersinia ruckeri, Renibacterium salmoninarum, Ceratomyxa shasta or the PKX agent. I have observed the spore stage of Ceratomyxa shasta in adult summer steelhead but to my knowledge the infective stage is not found in the upper Columbia river system. Also no outbreaks of the above agents have ever been diagnosed at the Wells hatchery.

I hope this information is useful to you. If you need any additional information please don't hesitate to call.

Sincerely yours,

Steve Roberts  
Fish Pathologist  
AFS/FHS

cc; J. Gearheard

04-30-1985 AT 00:12

WDG Salmonid Virus Inspections

Page 1

Hatchery	Date LifeStage	Species Sample	Stock Result
Wells	71/2 Adult	Summer Steelhead 4 OF	Wells Negative
Wells	78/4 Juvenile	Summer Steelhead 60 KS	Wells Negative
Wells	79/1 Adult	Summer Steelhead 52 OF & 55 KS	Wells Negative
Wells	80/2 Adult	Summer Steelhead 10 OF	Wells Negative
Wells	82/1 Adult	Summer Steelhead 65 OF & KS	Wells Negative
Wells	83/3 Adult	Summer Steelhead 411 OF & KS	Wells IPN ( 1% )
Wells	84/3 Adult	Summer Steelhead 414 OF & KS	Wells IPN ( 1% )
Wells	85/2 Adult	Summer Steelhead 366 OF & KS	Wells Negative
TOTAL		AVG	

Printed 8 of the 212 records.

## APPENDIX 4

### Water Quality Tables



**TABLE 1**  
**Similkameen River at Similkameen Falls (Station 0500075)**

Property		Period of Record	No. of Values	Values		
				Maximum	Minimum	Mean
Alkalinity	- total	1972-1979	20	75	18.7	42.9
BOD <sub>5</sub>		1973	3	L10	L10	0
Carbon	- organic	1972-1979	24	13	L1	3
	- inorganic	-	-	-	-	-
Chloride		1972-1979	24	11	0.3	1.7
COD		-	-	-	-	-
Coliform	- fecal	1974-1975	2	2	L2	-
Colour		1972-1978	20	20	L5	7.8
Cyanide		1973	3	L0.01	L0.01	-
Fluoride		1972-1978	12	L0.1	L0.1	-
Hardness	- total	1972	3	81	26	52.3
	- Calcium	1972-1982	28	24.6	6.1	13.6
	- Magnesium	1972-1982	28	4.1	0.46	2.12
<b>Metals:</b>						
Aluminum	- dissolved	1982	3	0.03	L0.02	-
Arsenic	- dissolved	1973-1982	8	L0.005	L0.005	-
	- total	1980	1	0.019	-	-
Barium	- total	-	-	-	-	-
Boron	- dissolved	1982	3	L0.01	L0.1	-
Cadmium	- dissolved	1972-1982	14	L0.01	L0.0001	-
	- total	1972	1	L0.0001	-	-
Chromium	- dissolved	1972-1982	12	L0.01	L0.005	L0.005
	- total	1972-1977	2	0.009	L0.005	-
Cobalt	- total	-	-	-	-	-
Copper	- dissolved	1972-1982	20	0.02	L0.001	0.004
	- total	1972	1	L0.001	-	-
Iron	- dissolved	1972-1982	21	0.1	L0.02	0.07
	- total	1972	1	0.08	-	-
Lead	- dissolved	1972-1982	16	L0.1	L0.001	-
	- total	1972	1	L0.003	-	-
Manganese	- dissolved	1972-1982	17	L0.02	L0.01	-
	- total	1972	1	L0.01	-	-
Mercury	- total	1972-1979	15	0.000066	L0.00005	-
Molybdenum	- dissolved	1973-1982	13	L0.01	L0.005	-
Nickel	- dissolved	1972-1982	13	0.05	L0.01	-
	- total	1972	1	L0.01	-	-
Silver	- total	-	-	-	-	-
Zinc	- dissolved	1972-1982	16	0.03	L0.005	-
	- total	1972	1	L0.005	-	-
<b>Nitrogen:</b>						
Ammonia		1975-1982	14	0.024	L0.005	0.007
Nitrate/nitrite		1972-1982	20	0.09	L0.02	0.03
Nitrate		1972-1976	12	0.09	L0.02	0.029
Nitrite		1972-1982	21	L0.005	L0.005	-
Total Organic		1972-1974	20	0.28	L0.01	0.07
Total Kjeldahl		1972-1982	23	0.18	L0.01	0.07
Total		1972-1982	27	0.32	L0.02	0.10

**TABLE 1 (Continued)**  
**Similkameen River at Similkameen Falls (Station 0500075)**

Property	Period of Record	No. of Values	Values		
			Maximum	Minimum	Mean
Oil and Grease	-	-	-	-	-
Oxygen - dissolved	1972-1982	21	14.9	5.8	11.6
- % saturation	1972-1982	21	158.3	73.6	94.7
Pesticides:					
Aldrin	-	-	-	-	-
BHC	-	-	-	-	-
Chlordane	-	-	-	-	-
DDE	-	-	-	-	-
DDD	-	-	-	-	-
P, P-DDT	-	-	-	-	-
Dieldrin	-	-	-	-	-
Endrin	-	-	-	-	-
Heptachlor	-	-	-	-	-
Methoxychlor	-	-	-	-	-
Thiodan	-	-	-	-	-
pH	1973-1982	22	8.1	7.3	7.7*
Phosphorus - total	1972-1982	30	0.085	0.003	0.015
- total dissolved	1979-1982	9	0.01	0.003	0.006
- ortho - dissolved	1972-1978	11	0.014	0.003	0.005
Polychlorinated Biphenyls					
Archlor 1248	-	-	-	-	-
Archlor 1254	-	-	-	-	-
Archlor 1260	-	-	-	-	-
Potassium - total	-	-	-	-	-
- dissolved	1972-1979	22	3.6	0.2	0.7
Silica	1972-1979	22	12.6	6.1	8.8
Sodium - dissolved	1972-1979	22	4.5	1.2	2.2
Solids - total	1972-1979	21	156.0	40.0	82.9
- dissolved	-	-	-	-	-
- suspended	-	-	-	-	-
Specific Conductivity	1972-1982	23	153.0	43.0	89.0
Sulphate	1972-1979	22	15.5	15.0	6.7
Temperature	1972-1982	27	14	0	4.4
Toxicity (Microtox)	1982	1	G100	-	-
Turbidity	1972-1982	14	9.2	0.1	2

\* All values are as mg/L except:

+ Median

L = Less Than

G = Greater Than

++ Data collected by Ministry of Environment.

- (1) Colour
- (2) Specific Conductivity in uM/cm
- (3) Temperature in (°C)
- (4) Turbidity in NTU
- (5) Microtox in %
- (6) Percent Saturation in %
- (7) pH
- (8) Coliform - fecal as MPN/100 mL



**TABLE 2**  
**Similkameen River Upstream of Newmont Mines (Station 0500417)**

Property		Period of Record	No. of Values	Values		
				Maximum	Minimum	Mean
Metals:						
Arsenic	- dissolved	1972-1981	15	L0.02	L0.001	-
	- total	1972-1973	13	L0.02	L0.02	-
Barium	- total	-	-	-	-	-
Boron	- dissolved	-	-	-	-	-
Cadmium	- dissolved	1972-1981	26	L0.05	-	-
	- total	1972-1973	13	L0.05	L0.01	-
Copper	- dissolved	1972-1981	27	L0.05	L0.0007	-
	- total	1972-1973	13	0.06	L0.05	-
Iron	- dissolved	1972-1981	27	0.16	0.0028	0.06
	- total	1972-1973	13	0.7	L0.05	-
Lead	- dissolved	1972-1978	25	L0.2	L0.0004	-
	- total	1972-1973	13	L0.2	L0.1	-
Manganese	- dissolved	1981	2	L0.01	L0.01	-
Molybdenum	- dissolved	1981	2	0.0005	0.0005	-
Nickel	- dissolved	1973-1973	13	L0.1	L0.002	-
	- total	1972-1973	13	L0.1	L0.005	-
Zinc	- dissolved	1972-1978	24	0.5	0.0008	-
	- total	1973-1973	12	0.06	L0.02	-
Nitrogen:						
Ammonia		1981	2	0.01	0.006	-
Nitrate/nitrite		1981	2	0.02	L0.02	-
Nitrite		1981	2	-	L0.005	-
Total Kjeldahl		1981	2	0.06	0.02	-
Oil and Grease		1972-1973	13	4	0.2	2.1
pH		1972-1981	28	8.2	6.4	7.7+
Phosphorus	- total	1981	2	-	0.008	-
Solids	- total	1972-1981	26	252	14	98.8
	- dissolved	1972-1981	14	182	38	102.9
	- suspended	1972-1981	26	112	L1	13.2
Specific Conductivity		1981	4	75	50	60
Sulphate		1972-1981	15	44	2.4	12.4
Temperature		1981	2	8	7	-
Toxicity (Microtox)		-	-	-	-	-
Turbidity		1981	2	20	1.1	-

\* All values are as mg/L except:

- (1) Colour
- (2) Specific Conductivity in uM/cm
- (3) Temperature in (°C)
- (4) Turbidity in NTU
- (5) Microtox in %
- (6) Percent Saturation in %
- (7) pH

+ Median

L = Less Than

\*\* Data collected by Newmont Mines and Ministry of Environment.

**TABLE 3**  
**Similkameen River Downstream of Newmont Mines (Station 0500418)**

Property			Period of Record	No. of Values	Values		
					Maximum	Minimum	Mean
<b>Metals:</b>							
Arsenic	- dissolved		1972-1981	14	L0.2	L0.001	-
	- total		1972-1973	13	L0.02	L0.02	-
Barium	- total		-	-	-	-	-
Boron	- dissolved		-	-	-	-	-
Cadmium	- dissolved		1972-1981	25	L0.05	0.0005	-
	- total		1972-1973	13	L0.05	L0.01	-
Copper	- dissolved		1972-1981	25	L0.05	0.001	-
	- total		1972-1973	13	0.06	L0.05	-
Iron	- dissolved		1972-1981	25	0.19	0.003	0.06
	- total		1972-1973	13	0.66	L0.05	0.18
Lead	- dissolved		1972-1978	24	L0.2	L0.0004	-
	- total		1972-1973	13	L0.2	L0.1	-
Manganese	- dissolved		1981	1	L0.01	-	-
Molybdenum	- dissolved		1981	1	0.0005	-	-
Nickel	- dissolved		1972-1973	13	L0.1	L0.002	-
	- total		1972-1973	13	L0.1	L0.05	-
Zinc	- dissolved		1972-1978	23	0.06	0.0004	-
	- total		1972-1973	12	0.06	L0.02	-
<b>Nitrogen:</b>							
Ammonia			1981	1	0.005	-	-
Nitrate/nitrite			1981	1	L0.02	-	-
Nitrite			1981	1	L0.005	-	-
Total Kjeldahl			1981	1	0.05	-	-
Oil and Grease			1972-1973	13	5	0.4	2.5
pH			1972-1981	26	8.2	6.5	7.6+
Phosphorus	- total		-	-	-	-	-
Solids	- total		1972-1981	24	248	13	94.7
	- dissolved		1972-1978	14	153	15	97
	- suspended		1981	24	107	L1	11.3
Specific Conductivity			1981	2	80	72	-
Sulphate			1972-1981	15	69	3.2	12.8
Temperature			1981	1	9	-	-
Toxicity (Microtox)			-	-	-	-	-
Turbidity			1981	1	2.2	-	-

\* All values are as mg/L except:

- (1) Colour
- (2) Specific Conductivity in uM/cm
- (3) Temperature in (°C)
- (4) Turbidity in NTU
- (5) Microtox in %
- (6) Percent Saturation in %
- (7) pH

+ Median

L = Less Than

++ Data collected by Ministry of Environment.

**TABLE 4**  
**Similkameen River at Princeton Upstream of Tulameen (Station 0500629)**

Property		Period of Record	No. of Values	Values		
				Maximum	Minimum	Mean
Alkalinity	- total	1966-1980	90	75.1	13.9	50.5
BOD <sub>5</sub>		-	-	-	-	-
Carbon	- organic	1971-1980	14	9	1.1	4.3
	- inorganic	1971-1974	8	12.1	6	8.9
Chloride		1966-1980	91	9.2	0.1	0.7
COD		1966-1970	14	7.9	1.05	2.5
Coliform	- fecal	-	-	-	-	-
Colour		1978	2	30	20	-
Cyanide		-	-	-	-	-
Fluoride		1966-1978	41	0.15	0.046	0.08
Hardness	- total	1966-1979	85	84.4	20	53.3
	- Calcium	1966-1982	94	26.8	6.5	16.7
	- Magnesium	1978-1982	11	4.1	0.64	2.3
<b>Metals:</b>						
Aluminum	- dissolved	1966-1982	11	0.15	1.01	0.05
Arsenic	- dissolved	1973-1982	10	0.005	1.0005	-
	- total	1980	1	0.006	-	-
Barium	- total	1973-1974	4	0.1	1.01	-
Boron	- dissolved	1982	5	1.01	1.01	-
Cadmium	- dissolved	1978-1982	9	1.01	1.00005	-
	- total	1973-1974	4	1.001	1.001	-
Chromium	- dissolved	1982	5	1.01	-	-
	- total	1973	1	1.001	-	-
Cobalt	- total	1973-1974	4	1.001	1.001	-
Copper	- dissolved	1967-1982	35	0.11	1.001	0.001
	- total	1969-1980	11	0.045	1.001	0.01
Iron	- dissolved	1966-1982	45	0.2	1.001	0.030
	- total	1973-1980	6	1.2	0.017	0.37
Lead	- dissolved	1967-1982	25	1.01	1.001	-
	- total	1969-1980	11	0.01	1.001	-
Manganese	- dissolved	1970-1982	20	1.02	1.01	-
	- total	1966-1980	25	0.04	1.01	-
Mercury	- total	1973-1980	10	1.000005	1.000005	-
Molybdenum	- dissolved	1979-1982	14	1.01	1.00005	-
Nickel	- dissolved	1978-1982	6	1.01	1.01	-
	- total	1973-1980	5	1.01	1.001	-
Silver	- total	1973-1974	3	1.01	1.01	-
Zinc	- dissolved	1967-1982	29	0.02	1.001	-
	- total	1969-1980	11	0.013	1.001	-
<b>Nitrogen:</b>						
Ammonia		1966-1982	38	0.1	1.0005	-
Nitrate/nitrite		1966-1982	91	0.46	1.001	0.03
Nitrate		1978-1982	18	0.22	1.02	0.039
Nitrite		1978-1982	18	1.0005	1.0005	-
Total Organic		1978-1982	18	0.29	1.01	0.13
Total Kjeldahl		1973-1982	23	1.05	1.01	-
Total		1978-1982	17	0.2	1.02	0.16

**TABLE 4 (Continued)**  
**Similkameen River at Princeton Upstream of Tulameen (Station 0500629)**

Property	Period of Record	No. of Values	Values		
			Maximum	Minimum	Mean
Oil and Grease	-	-	-	-	-
Oxygen - dissolved	1973-1982	16	16	7.6	12-
- % saturation	1973-1982	13	120.2	68.7	90.6
<b>Pesticides:</b>					
Aldrin	1974	1	L0.000005	-	-
BHC	1974	1	L0.000005	-	-
Chlordane	1974	1	L0.000005	-	-
DDE	1974	1	L0.000005	-	-
DDD	1974	1	L0.000005	-	-
P, P-DDT	1974	1	L0.000005	-	-
Dieldrin	1974	1	L0.000005	-	-
Endrin	1974	1	L0.000001	-	-
Heptachlor	1974	1	L0.000005	-	-
Methoxychlor	1974	1	L0.000001	-	-
Thiodan	1974	1	L0.000001	-	-
pH	1966-1982	103	8.3	6.9	7.9+
Phosphorus - total	1967-1982	37	0.212	L0.002	0.027
- total dissolved	-	-	-	-	-
- ortho - dissolved	1967-1978	21	0.07	L0.002	0.009
<b>Polychlorinated Biphenyls</b>					
Archlor 1248	1974	1	L0.0001	-	-
Archlor 1254	1974	1	L0.0001	-	-
Archlor 1260	1974	1	L0.0001	-	-
Potassium - total	1966-1974	83	1	0.3	0.62
- dissolved	-	-	-	-	-
Silica	1966-1980	81	15	5.6	9.3
Sodium - dissolved	1966-1980	90	11.6	1	3.1
Solids - total	1978-1981	5	258	70	60
- dissolved	1966-1979	12	113	43	73.9
- suspended	1967-1981	20	208	L1	47.1
Specific Conductivity	1966-1982	103	185	47	116
Sulphate	1966-1982	93	15.5	2.4	8.2
Temperature	1967-1982	62	18.5	0	6.4
Toxicity (Microtox)	1982	3	G100	G100	G100
Turbidity	1966-1982	98	55	L0.1	5.7

\* All values are as mg/L except:

- (1) Colour
- (2) Specific Conductivity in uM/cm
- (3) Temperature in (°C)
- (4) Turbidity in NTU
- (5) Microtox in %
- (6) Percent Saturation in %
- (7) pH
- (8) Coliform - fecal as MPN/100 mL

+ Median

L = Less Than

G = Greater Than

\*\* Data collected by Environment Canada and Ministry of Environment.

**TABLE 5**  
**Tulameen River at Highway 5 Bridge Near Mouth (Station 050083)**

Property		Period of Record	No. of Values	Values		
				Maximum	Minimum	Mean
Alkalinity	- total	1966-1979	102	118	18.2	57.9
BOD <sub>5</sub>		1971-1975	5	L10	L10	-
Carbon	- organic	1971-1974	8	16	5.1	10.4
	- inorganic	1971-1978	31	9	L1	4
Chloride		1966-1978	102	2.6	0.1	0.7
Coliform	- fecal	1975	1	7	-	-
Colour		1972-1974	78	35	25	8.5
COD		1966-1970	13	5.8	L0.5	2.5
Dissolved Oxygen		1973-1982	28	15.1	4	11.1
Fluoride		1966-1978	52	0.13	0.038	0.085
Hardness	- total	1966-1978	102	126	20.3	64.5
	- Calcium	1966-1982	107	38	5.7	20.2
	- Magnesium	1972-1982	26	7.5	1	3.6
<b>Metals:</b>						
Aluminum	- dissolved	1966-1967	6	0.22	0.02	0.076
Arsenic	- dissolved	1973-1982	6	L0.25	L0.005	-
Boron	- dissolved	1974-1982	4	L0.1	L0.01	-
Barium	- total	1973-1974	3	0.1	L0.1	-
Cadmium	- dissolved	1974-1982	15	L0.01	L0.0005	-
	- total	1972-1982	9	L0.001	L0.001	-
Chromium	- dissolved	1972-1979	9	L0.01	L0.005	0.007
	- total	1972-1982	4	L0.005	L0.005	-
Cobalt	- total	1972-1976	4	L0.001	L0.001	-
Copper	- dissolved	1973-1974	36	0.012	L0.001	0.006
	- total	1967-1982	14	0.02	L0.001	0.005
Iron	- dissolved	1966-1979	45	0.1	L0.001	0.034
	- total	1966-1982	9	0.5	-0.008	0.202
Lead	- dissolved	1972-1979	31	L0.1	L0.001	-
	- total	1967-1982	11	L0.01	L0.01	-
Manganese	- dissolved	1969-1976	22	0.04	L0.01	0.014
	- total	1970-1982	27	0.04	L0.01	0.013
Molybdenum	- dissolved	1966-1979	7	L0.01	L0.0005	-
Nickel	- dissolved	1974-1982	11	L0.05	L0.01	-
	- total	1972-1982	7	L0.01	L0.01	-
Zinc	- dissolved	1972-1976	36	0.05	L0.001	0.008
	- total	1967-1982	12	0.01	L0.001	0.007
<b>Nitrogen:</b>						
Ammonia	- dissolved	1974-1982	37	0.2	L0.005	0.006
	- total	1972-1974	5	0.02	L0.01	0.012
Nitrate/nitrite		1966-1982	92	0.5	L0.001	0.034
Nitrate		1972-1982	13	0.07	L0.02	0.030
Nitrite		1972-1982	23	L0.005	L0.005	-
Total Organic		1972-1982	22	0.41	0.01	0.13
Total Kjeldahl		1972-1982	31	L0.5	0.01	0.04

**TABLE 5 (Continued)**  
**Tulameen River at Highway 5 Bridge Near Mouth (Station 050083)**

Property	Period of Record	No. of Values	Values		
			Maximum	Minimum	Mean
Pesticides:					
Aldrin	1974	1	L0.000005	-	-
BHC	1974	1	L0.000005	-	-
Chlordane	1974	1	L0.000005	-	-
DDE	1974	1	L0.000005	-	-
DDD	1974	1	L0.000005	-	-
P, P-DDT	1974	1	L0.000005	-	-
Dieldrin	1974	1	L0.000005	-	-
Endrin	1974	1	L0.00001	-	-
Heptachlor	1974	1	L0.000005	-	-
Methoxychlor	1974	1	L0.00001	-	-
Thiodan	1974	1	L0.00001	-	-
pH	1972-1982	109	8.3	6.9	7.9+
Phosphorus - total	1972-1982	48	0.11	L0.002	0.013
- ortho dissolved	1972-1978	14	0.009	L0.003	0.003
Polychlorinated Biphenyls					
Archlor 1248	1974	1	L0.0001	-	-
Archlor 1254	1974	1	L0.0001	-	-
Archlor 1260	1974	1	L0.0001	-	-
Potassium - dissolved	1972-1978	23	2.4	0.3	0.71
Silica	1966-1978	95	12.2	3.6	8
Sodium - dissolved	1968-1978	103	8.4	0.9	2.6
Solids - total	1972-1981	25	164	54	104.4
- filterable	1966-1981	9	132	44	90.9
- suspended	1967-1981	32	87	0.5	15.8
Specific Conductivity	1966-1982	108	225	46	136
Sulphate	1966-1978	104	34	2.5	10.9
Temperature	1967-1982	75	20.6	0	6.5
Turbidity	1966-1982	96	56	L0.1	3.5

\* All values are as mg/L except:

- (1) Colour
- (2) Specific Conductivity in uM/cm
- (3) Temperature in (°C)
- (4) Turbidity in NTU
- (5) Fecal coliform as MPN/100 mL
- (6) pH

+ Median

L = Less Than

+ Median Value

\*\* Data collected by Environment Canada and Ministry of Environment.

**TABLE 6**  
**Similkameen River Above Allison Creek (Station 0500074)**

Property		Period of Record	No. of Values	Values		
				Maximum	Minimum	Mean
Alkalinity	- total	1971-1978	22	92.1	21.5	56.2
BOD <sub>5</sub>		1971-1975	8	L10	L10	-
Carbon	- organic	1971-1978	23	9	0.3	3.3
	- inorganic	-	-	-	-	-
Chloride		1972-1978	20	2	L0.5	1.03
COD		-	-	-	-	-
Colour		1971-1978	23	30	L5	8.3
Dissolved Oxygen		1971-1978	22	15.2	8.5	12.3
Fluoride		1971-1978	15	0.12	L0.1	-
Hardness	- total	1971-1972	3	92.6	48	71.2
	- Calcium	1971-1977	25	32	6.7	18.4
	- Magnesium	1972-1978	21	5.9	0.99	3.11
<b>Metals:</b>						
Aluminum	- dissolved	-	-	-	-	-
Arsenic	- dissolved	1973-1975	4	0.027	L0.005	-
	- total	1971	1	L0.002	-	-
Barium	- dissolved	-	-	-	-	-
	- total	-	-	-	-	-
Cadmium	- dissolved	1973-1978	8	0.0006	L0.0001	-
	- total	1971-1972	6	0.0016	L0.0001	-
Chromium	- total	1972-1976	3	L0.005	L0.005	-
Cobalt	- total	-	-	-	-	-
Copper	- dissolved	1971-1977	14	0.14	L0.001	-
	- total	1972-1976	3	0.003	L0.001	-
Iron	- dissolved	1972-1978	11	0.4	L0.04	0.129
	- total	1971-1976	7	0.8	L0.02	0.17
Lead	- dissolved	1971-1978	12	0.003	L0.001	0.002
	- total	1972-1976	3	L0.003	L0.001	-
Manganese	- dissolved	1971-1977	13	L0.02	L0.01	-
	- total	1972-1976	3	L0.02	L0.01	-
Mercury	- total	1971-1978	12	0.00007	L0.00005	-
Molybdenum	- dissolved	1971-1974	7	L0.1	L0.0005	-
Nickel	- dissolved	1971-1978	12	0.02	L0.01	-
	- total	1972-1976	3	0.01	L0.01	-
Silver	- total	-	-	-	-	-
Zinc	- dissolved	1971-1978	13	0.72	L0.005	0.072
	- total	1972-1976	3	L0.005	L0.005	-
<b>Nitrogen:</b>						
Ammonia	- dissolved	1974-1978	9	0.023	L0.005	0.010
	- total	1971-1973	4	0.04	L0.01	0.02
Nitrate/nitrite		1972-1978	12	0.08	L0.02	0.033
Nitrate		1972-1976	9	0.09	L0.02	-
Nitrite		1972-1978	12	L0.005	L0.005	-
Total Organic		1971-1978	15	0.26	0.04	0.12
Total Kjeldahl		1972-1978	18	0.26	0.03	0.12
pH		-	-	-	-	-

**TABLE 6 (Continued)**  
**Similkameen River Above Allison Creek (Station 0500074)**

Property	Period of Record	No. of Values	Values		
			Maximum	Minimum	Mean
Pesticides:					
Aldrin	-	-	-	-	-
BHC	-	-	-	-	-
Chlordane	-	-	-	-	-
DDE	-	-	-	-	-
DDD	-	-	-	-	-
P, P-DDT	-	-	-	-	-
Dieldrin	-	-	-	-	-
Endrin	-	-	-	-	-
Heptachlor	-	-	-	-	-
Methoxychlor	-	-	-	-	-
Thiodan	-	-	-	-	-
Phosphorus - total	1971-1978	24	0.245	L0.003	0.031
- ortho dissolved	1972-1978	13	0.028	L0.003	-
Polychlorinated Biphenyls:					
Archlor 1248	-	-	-	-	-
Archlor 1254	-	-	-	-	-
Archlor 1260	-	-	-	-	-
Potassium - total	1971-1978	26	1.7	0.3	0.7
Silica	1971-1978	25	13.1	23	9.1
Sodium - dissolved	1972-1978	21	5.4	1.6	3.2
Solids - total	1971-1978	24	418	54	125
- dissolved	-	-	-	-	-
- suspended	1971-1978	23	308	0.2	32.2
Specific Conductivity	1971-1978	38	850	48	138.5
Sulphate	1971-1978	25	18.5	L5	10.3
Temperature	1971-1978	24	17	0	5.85
Turbidity	1972-1975	9	4.8	0.5	1.5

\* All values are as mg/L except:

- (1) Colour
- (2) Specific Conductivity in uM/cm
- (3) Temperature in (°C)
- (4) Turbidity in NTU
- (5) pH

+ Median

L = Less Than

\*\* Data collected by Environment Canada and Ministry of Environment.



**TABLE 7**  
**Allison Creek Near Mouth (Station 0500003)**

Property		Period of Record	No. of Values	Values		
				Maximum	Minimum	Mean
Alkalinity	- total	1971-1982	26	198	122	170.4
BOD <sub>5</sub>		1971-1975	8	L10	L10	-
Carbon	- organic	1972-1978	23	13	L1	3.9
Chloride		1971-1978	25	2.9	0.5	1.6
Coliform	- fecal	1974-1982	4	33	L2	20+
Colour		1971-1977	25	15	L5	5.6
Cyanide		1973-1975	4	L0.01	L0.01	-
Dissolved Oxygen		1972-1982	24	14.4	3.5	11
Percent Saturation		1972-1982	22	118	24.7	95.9
Fluoride		1971-1978	0.22	L0.1	0.13	
Hardness	- total	1972-1975	4	210	148	188.5
	- Calcium	1971-1982	31	70.5	40.7	58.3
	- Magnesium	1971-1982	26	15.5	10.1	13.3
<b>Metals:</b>						
Aluminum	- dissolved	1982	3	L0.01	L0.01	-
Arsenic	- total	1971-1982	7	L0.25	L0.002	-
	- dissolved	1973-1975	4	L0.005	L0.005	-
Boron	- dissolved	1971	10	0.2	L0.2	-
Cadmium	- dissolved	1972-1982	17	L0.01	L0.0005	-
	- total	1971-1981	6	0.001	0.0001	0.0005
Chromium	- dissolved	1972-1982	10	L0.01	L0.005	-
	- total	1972-1976	2	L0.005	L0.005	-
	- hexavalent	1971	4	L0.005	L0.005	-
Copper	- dissolved	1971-1982	23	0.15	L0.001	0.011
	- total	1972-1981	3	0.005	L0.001	0.002
Iron	- dissolved	1971-1982	22	0.22	L0.02	0.075
	- total	1972-1976	2	1.7	0.44	1.07
Lead	- dissolved	1971-1982	19	L0.1	L0.001	-
	- total	1972-1976	2	L0.003	0.001	0.002
Manganese	- dissolved	1971-1982	19	0.02	L0.01	0.014
	- total	1972-1976	2	0.04	0.01	0.025
Mercury	- total	1971-1980	16	0.00011	L0.00005	0.00005
Molybdenum	- dissolved	1971-1982	12	L0.1	L0.005	-
Nickel	- dissolved	1971-1982	17	L0.005	L0.01	-
	- total	1972-1976	2	L0.01	L0.01	-
Zinc	- dissolved	1971-1982	22	0.77	0.003	0.046
	- total	1972-1981	3	0.013	L0.005	0.008
<b>Nitrogen:</b>						
Ammonia	- dissolved	1974-1982	17	0.025	L0.005	0.007
	- total	1972-1973	4	L0.01	L0.01	-
Nitrate/nitrite		1972-1982	21	0.59	0.05	0.253
Nitrate		1971-1982	10	0.39	0.05	0.23
Nitrite		1971-1982	22	L0.005	L0.005	-
Total Organic		1971-1982	24	0.31	0.02	0.13
Total Kjeldahl		1972-1982	26	0.24	L0.01	0.093

**TABLE 7 (Continued)**  
**Allison Creek Near Mouth (Station 0500003)**

Property	Period of Record	No. of Values	Values		
			Maximum	Minimum	Mean
pH	1971-1982	30	8.6	8.1	8.3+
Phosphorus - total	1972-1982	34	1.03	0.004	0.049
- ortho - dissolved	1972-1978	13	0.016	L0.003	0.005
Potassium - dissolved	1971-1978	27	2.8	1	1.4
Silica	1971-1978	26	16	7.2	13.7
Sodium - dissolved	1972-1978	23	10.1	5.2	8.1
Solids - total	1971-1977	27	1046	226	315
- suspended	1971-1979	27	714	L1	36.6
Specific Conductivity	1971-1982	31	474	287	409
Sulphate	1971-1980	31	61.1	30.1	46.9
Temperature	1971-1982	36	17	0	7.2
Turbidity	1972-1982	17	5.5	0.3	1.4

\* All values are as mg/L except:

+ Median

L = Less Than

+ Median

\*\* Data collected by Ministry of Environment.

- (1) Colour
- (2) Specific Conductivity in uM/cm
- (3) Temperature in (°C)
- (4) Turbidity in NTU
- (5) Percent Saturation in %
- (6) Fecal coliform as NPN/100 mL
- (7) pH

**TABLE 8**  
**Similkameen River Upstream of Princeton Sewage Plant (Station 0500724)**

Property	Period of Record	No. of Values	Values		
			Maximum	Minimum	Mean
Alkalinity - total	1979	2	74.6	60.6	67.6
Carbon - organic	1979	4	2	L1	1.2
Chloride	1979	4	1.4	0.6	1.08
Coliform - fecal	1979-1982	17	33	L2	5+
Dissolved Oxygen	1979-1982	13	15	7.4	10.5
Percent Saturation	1979-1982	13	124.2	86.8	95.1
Fluoride	1979	2	L0.1	L0.1	L0.1
Hardness - Calcium	1979	2	12.2	11.3	11.8
- Magnesium	1979	2	3	2	2.5
<b>Metals:</b>					
Arsenic - dissolved	1979	2	L0.005	L0.005	L0.005
Boron - dissolved	1979	2	L0.1	L0.1	L0.1
Cadmium - dissolved	1979	2	L0.0005	L0.0005	L0.0005
Chromium - dissolved	1979	2	0.005	L0.005	-
Copper - dissolved	1979	2	0.001	L0.001	-
Iron - dissolved	1979	2	L0.1	L0.1	L0.1
Lead - dissolved	1979	2	L0.001	L0.001	L0.001
Manganese - dissolved	1979	2	L0.02	L0.02	L0.02
Mercury - total	1979	2	L0.00005	L0.00005	L0.00005
Molybdenum - dissolved	1979	2	0.0016	0.0012	0.0014
Zinc - dissolved	1979	2	0.007	L0.005	-
<b>Nitrogen:</b>					
Ammonia - dissolved	1979-1982	18	0.027	L0.005	0.006
Nitrate/nitrite	1979-1982	18	0.08	L0.02	-
Nitrite	1979-1982	18	L0.005	L0.005	-
Total Kjeldahl	1979-1982	18	0.3	0.02	0.11
pH	1979-1982	17	8.3	7.6	8+
Phosphorus - total	1979-1982	12	0.089	0.005	0.016
- ortho - dissolved	1979	4	L0.003	L0.003	-
Silica	1979	1	8.2	-	-
Sodium - dissolved	1979	2	3.1	2.6	2.75
Solids - total	1979	5	122	64	90.8
- suspended	1979	5	5	3	1
Specific Conductivity	1979-1982	17	185	56	129.3
Sulphate	1979	2	7.8	L5	-
Sulphide	1979	2	L0.5	L0.5	L0.5
Temperature	1979-1982	17	22	0	10.1
Turbidity	1979-1982	12	44	0.3	6.2

\* All values are as mg/L except:

+ Median

L = Less Than

(1) Specific Conductivity in uM/cm

(2) Temperature in (°C)

(3) Turbidity in NTU

(4) Fecal coliform as MPN/100 mL

(5) Percent Saturation in %

(6) pH

\*\* Data collected by Ministry of Environment.

+ Median

**TABLE 9**  
**Similkameen River Downstream From Princeton Sewage Plant (Station 0500725)**

Property		Period of Record	No. of Values	Values		
				Maximum	Minimum	Mean
Alkalinity	- total	1979	2	86.8	68.3	77.5
Carbon	- organic	1979-1981	5	1	L1	-
Chloride		1979	4	1.4	0.7	1.08
Coliform	- fecal	1979-1982	17	23	L2	2+
Dissolved Oxygen		1979-1982	13	16.2	7.6	10.6
Percent Saturation		1979-1982	13	114.4	85.9	95.4
Fluoride		1979	2	L0.1	L0.1	-
Hardness	- Calcium	1979	2	12.2	11.8	12
	- Magnesium	1979	2	3.5	2.2	2.9
<b>Metals:</b>						
Arsenic	- dissolved	1979-1981	3	L0.005	L0.005	L0.005
Boron	- dissolved	1979	2	L0.1	L0.1	L0.01
Cadmium	- dissolved	1979-1981	3	L0.0005	L0.0005	L0.0005
Chromium	- dissolved	1979	2	0.005	0.005	0.005
Copper	- dissolved	1979-1981	3	0.002	L0.001	-
Iron	- dissolved	1979-1981	3	L0.1	L0.01	-
Lead	- dissolved	1979-1981	3	L0.001	L0.001	L0.001
Manganese	- dissolved	1979-1981	3	L0.02	L0.01	-
Mercury	- total	1979	2	L0.00005	L0.00005	L0.0000
Molybdenum	- dissolved	1979-1981	3	0.0015	0.0013	0.0014
Zinc	- dissolved	1979-1981	3	0.66	L0.005	-
<b>Nitrogen:</b>						
Ammonia	- dissolved	1979-1982	18	0.03	L0.005	-
Nitrate/nitrite		1979-1982	18	0.07	L0.02	-
Nitrite		1979-1982	18	L0.005	L0.005	-
Total Kjeldahl		1979-1982	18	0.31	0.04	0.10
pH		1979-1982	17	8.4	7.6	8.1+
Phosphorus	- total	1979-1982	18	0.133	0.005	0.017
	- ortho - dissolved	1979-1981	5	0.003	L0.003	-
Silica		1979	1	8.1	-	-
Sodium	- dissolved	1979	2	3.1	2.4	2.75
Solids	- total	1979-1981	6	138	68	100
	- suspended	1979	6	2	L1	1.5
Specific Conductivity		1979-1982	17	199	58	135.5
Sulphate		1979	2	9.3	L5	-
Sulphide		1979	2	L0.5	L0.5	-
Temperature		1979-1982	16	22	0	-
Turbidity		1979-1982	12	52	0.3	-

\* All values are as mg/L except:

+ Median

L = Less Than

\*\* Data collected by Ministry of Environment.

+ Median

- (1) Specific Conductivity in uM/cm
- (2) Temperature in (°C)
- (3) Turbidity in NTU
- (4) Fecal coliform as MPN/100 mL
- (5) Percent Saturation in %
- (6) pH

**TABLE 10**  
**Hayes Creek at Road Bridge Near Mouth (Station 0500031)**

Property		Period of Record	No. of Values	Values		
				Maximum	Minimum	Mean
Alkalinity	- total	1972-1979	21	79.3	19.1	49.2
BOD <sub>5</sub>		1973-1975	2	L10	L10	-
Carbon	- organic	1972-1979	24	19	L1	6.8
Chloride		1972-1978	22	2.2	0.6	1
Coliform	- fecal	1974-1975	2	130	79	-
Colour		1972-1978	22	50	5	17.5
Dissolved Oxygen		1972-1982	24	15.5	7.7	11.6
Percent Saturation		1972-1982	22	117.2	54.4	96.6
Fluoride		1972-1978	13	0.17	L0.1	0.11
Hardness	- total	1972-1975	4	64	25	49.2
	- Calcium	1972-1982	27	61	5.7	17.2
	- Magnesium	1972-1982	26	14.5	0.95	3.3
<b>Metals:</b>						
Aluminum	- dissolved	1982	3	0.03	0.02	-
Arsenic	- dissolved	1982	3	L0.25	L0.25	-
Boron	- dissolved	1982	3	L0.01	L0.01	-
Cadmium	- dissolved	1972-1982	15	L0.01	L0.0001	-
	- total	1972-1982	4	L0.001	L0.0005	-
Chromium	- dissolved	1972-1982	10	L0.01	L0.005	-
	- total	1972-1976	2	L0.005	L0.005	-
Copper	- dissolved	1972-1982	15	0.02	L0.001	0.0048
	- total	1972-1976	2	0.003	0.001	0.002
Iron	- dissolved	1972-1982	17	0.36	L0.04	0.164
	- total	1972-1981	4	0.6	0.1	0.32
Lead	- dissolved	1972-1982	12	L0.1	L0.001	-
	- total	1972-1976	2	L0.003	L0.001	-
Manganese	- dissolved	1972-1982	15	0.05	L0.01	0.02
	- total	1972-1981	4	0.07	L0.02	0.035
Mercury	- total	1972-1979	13	0.00015	L0.00005	0.00005
Molybdenum	- dissolved	1974-1982	5	L0.01	L0.0005	-
Nickel	- dissolved	1972-1982	12	L0.05	L0.01	-
	- total	1972-1976	2	L0.01	L0.01	-
Zinc	- dissolved	1972-1982	13	0.04	L0.005	0.012
	- total	1972-1981	4	0.04	L0.005	0.015
<b>Nitrogen:</b>						
Ammonia		1974-1982	17	0.038	L0.005	0.011
Nitrate/nitrite		1972-1982	22	0.33	L0.02	0.07
Nitrate		1972-1982	13	0.11	L0.02	0.04
Nitrite		1972-1982	23	L0.005	L0.005	L0.005
Total Organic		1972-1982	22	0.54	0.05	0.23
Total Kjeldahl		1972-1982	27	0.59	0.02	0.21
pH		1972-1982	29	8.2	7.3	7.9+
Phosphorus	- total	1979-1982	32	0.192	0.005	0.021
	- total dissolved	1972-1978	8	0.01	0.005	0.007
	- ortho - dissolved	1972-1978	13	0.018	L0.003	0.005
Potassium	- dissolved	1972-1978	23	2.3	0.6	0.15

**TABLE 10**  
**Hayes Creek at Road Bridge Near Mouth (Station 0500031)**

Property	Period of Record	No. of Values	Values		
			Maximum	Minimum	Mean
Silica	1972-1979	25	20.6	12.8	16.8
Sodium - dissolved	1972-1978	23	8.5	2.2	4.2
Solids - total	1972-1980	24	316	82	116.4
- total fixed	1972-1978	22	268	50	89.2
Specific Conductivity	1972-1982	29	176	43	114
Sulphate	1972-1979	24	52.4	15	10.8
Temperature	1972-1982	32	19	0	6
Turbidity	1972-1982	18	3.8	0.4	1.3

\* All values are as mg/L except:

+ Median

L = Less Than

++ Data collected by Ministry of Environment.

+ Median

- (1) Colour
- (2) Specific Conductivity in uM/cm
- (3) Temperature in (°C)
- (4) Turbidity in NTU
- (5) Fecal coliform as MPN/100 mL
- (6) Percent Saturation in %
- (7) pH

**TABLE 11**  
**Wolf Creek Downstream of Newmont Mines (Station 0500101)**

Property		Period of Record	No. of Values	Values		
				Maximum	Minimum	Mean
Alkalinity	- total	1971-1980	61	123	60	106.6
BOD <sub>5</sub>		1973-1974	4	110	110	-
Carbon	- organic	1972-1979	26	18	2	7.3
Chloride		1971-1979	30	41.4	1	19.7
Coliform	- fecal	-	-	-	-	-
Colour		1971-1975	12	20	15	8.8
Cyanide	- total	1972-1975	5	0.02	0.01	-
Dissolved Oxygen		1971-1982	74	14.8	5.8	10.9
Percent Saturation		1971-1982	65	116.5	41	92.7
Fluoride		1971-1975	23	0.22	0.1	0.16
Hardness	- total	1972-1975	3	190	117	147.7
	- Calcium	1971-1982	36	70.5	21.7	46.6
	- Magnesium	1972-1982	33	19.3	6.6	13.9
<b>Metals:</b>						
Aluminum	- dissolved	1982	1	0.02	-	-
Arsenic	- dissolved	1972-1982	27	0.25	0.001	-
	- total	1971-1981	19	0.02	0.001	-
Boron	- dissolved	1974	2	0.1	0.1	-
Cadmium	- dissolved	1972-1982	60	0.05	0.0001	-
	- total	1971-1975	22	0.05	0.0001	-
Chromium	- dissolved	1972-1982	19	0.01	0.005	0.006
	- total	1972-1975	7	0.009	0.005	0.006
Copper	- dissolved	1971-1982	89	0.17	0.001	-
	- total	1972-1980	50	0.05	0.001	-
Iron	- dissolved	1971-1982	78	0.3	0.004	0.074
	- total	1972-1980	20	0.3	0.05	-
Lead	- dissolved	1971-1982	60	0.2	0.0004	-
	- total	1972-1975	20	0.2	0.001	-
Manganese	- dissolved	1971-1982	27	0.07	0.01	0.033
	- total	1972-1975	7	0.07	0.02	0.037
Mercury	- total	1971-1979	12	0.0002	0.00005	-
Molybdenum	- dissolved	1971-1982	35	0.1	0.0005	0.008+
Nickel	- dissolved	1971-1982	36	0.1	0.01	-
	- total	1972-1975	20	0.01	0.01	-
Zinc	- dissolved	1971-1982	70	0.84	0.0006	0.022
	- total	1972-1978	48	0.06	0.005	-
<b>Nitrogen:</b>						
Ammonia	- dissolved	1974-1981	22	0.045	0.005	0.01
	- total	1971-1974	10	0.15	0.01	0.04
Nitrate/nitrite		1972-1981	10	0.04	0.02	0.02
Nitrate		1971-1981	32	0.32	0.02	0.03
Nitrite		1972-1981	29	0.005	0.005	-
Total Organic		1971-1974	13	0.59	0.1	0.26
Total Kjeldahl		1972-1981	25	0.39	0.09	0.20
Oil and Grease		1972-1974	14	6	0.5	2.9
pH		1971-1982	121	8.3	7.2	7.9+

**TABLE 11 (Continued)**  
**Wolf Creek Downstream of Newmont Mines (Station 0500101)**

Property	Period of Record	No. of Values	Values		
			Maximum	Minimum	Mean
Phosphorus - total	1971-1981	41	0.14	0.035	0.06
- ortho - dissolved	1972-1975	27	0.097	0.03	0.042
Potassium - dissolved	1971-1979	31	4.4	1.3	2.4
Silica	1971-1979	29	32.9	23.5	26.9
Sodium - dissolved	1972-1980	30	57	6.4	22.1
Solids - total	1971-1981	121	676	145	345
- dissolved	1971-1979	24	500	136	264
- suspended	1972-1981	118	317	L1	11.7
Specific Conductivity	1971-1982	87	795	190	489
Sulphate	1971-1981	77	241	10	103.8
Temperature	1971-1982	86	19	0	7.2
Toxicity (Microtox)	1981	1	G100	-	-
Turbidity	1972-1982	29	13	0.5	2.5

\* All values are as mg/L except:

+ Median

L = Less Than

G = Greater Than

- (1) Colour
- (2) Specific Conductivity in uM/cm
- (3) Temperature in (°C)
- (4) Turbidity in NTU
- (5) Microtox in %
- (6) pH
- (7) Percent Saturation in %
- (8) Fecal coliform as MPN/100 mL

++ Data collected by Newmont Mines and Ministry of Environment.

+ Median



**TABLE 12**  
**Similkameen River at Hedley Upstream of Hedley Creek (Station 0920118)**

Property		Period of Record	No. of Values	Values		
				Maximum	Minimum	Mean
Alkalinity	- total	1966-1974	60	97.4	21.4	64
BOD <sub>5</sub>	-	-	-	-	-	-
Carbon	- organic	1971-1974	7	12	1.5	5
	- inorganic	1966-1974	7	14.5	5	10
Chloride	-	1966-1974	60	1.9	0.2	-
COD	-	1966-1970	10	5.2	1.05	2
Colour	-	1966-1974	60	40	15	9
Dissolved Oxygen	-	1973-1974	3	14	9.7	12
Fluoride	-	1966-1974	36	0.22	0.04	-
Hardness	- total	1966-1974	58	117	23.4	70
	- Calcium	1966-1974	60	33.9	7.1	22.2
	- Magnesium	1966	1	2.9	-	-
<b>Metals:</b>						
Aluminum	- dissolved	1966-1968	5	0.6	0.01	0.1
Arsenic	- dissolved	1973-1974	3	0.014	1.0005	-
	- total	-	-	-	-	-
Barium	- dissolved	1974	1	1.01	-	-
	- total	1973-1974	3	0.1	1.01	0.1
Cadmium	- dissolved	-	-	-	-	-
	- total	1973-1974	4	1.0001	1.0001	-
Chromium	- total	1974	1	1.0001	-	-
Cobalt	- total	1973-1974	4	1.0001	1.0001	-
Copper	- dissolved	1966-1972	13	1.001	0.001	-
	- total	1969-1974	11	0.024	1.0001	-
Iron	- dissolved	1966-1972	24	0.06	1.0001	-
	- total	1973-1974	5	0.6	1.0005	0.2
Lead	- dissolved	1966-1972	10	1.005	1.0001	-
	- total	1966-1972	11	1.001	1.0001	-
Manganese	- dissolved	1971-1972	6	1.001	1.001	-
	- total	1966-1974	24	0.14	1.001	-
Mercury	- total	1973-1974	4	1.000005	1.000005	-
Molybdenum	- dissolved	1973-1974+	4+	1.2+	1.000002+	0.3
Nickel	- dissolved	-	-	-	-	-
	- total	1973-1974	4	0.006	1.0001	-
Silver	- total	1973-1974	3	1.001	1.001	-
Zinc	- dissolved	1967-1972	13	0.02	1.0001	-
	- total	1969-1974	11	0.025	1.0001	-
<b>Nitrogen:</b>						
Ammonia	- dissolved	-	-	-	-	-
	- total	1966-1974	18	0.3	1.0005	0.012
Nitrate/nitrite	-	1966-1974	54	0.025	1.0001	0.04
Nitrate	-	-	-	-	-	-
Nitrite	-	-	-	-	-	-
Total Organic	-	-	-	-	-	-
Total Kjeldahl	-	1973-1974	4	1.05	0.079	-
pH	-	1966-1974	59	8.3	6.8	7.9++

**TABLE 12 (Continued)**  
**Similkameen River at Hedley Upstream of Hedley Creek (Station 0920118)**

Property	Period of Record	No. of Values	Values		
			Maximum	Minimum	Mean
<b>Pesticides:</b>					
Aldrin	1974	1	L0.000005	-	-
BHC	1974	1	L0.000005	-	-
Chlordane	1974	1	L0.000005	-	-
DDE	1974	1	L0.000005	-	-
DDD	1974	1	L0.000005	-	-
P, P-DDT	1974	1	L0.000005	-	-
Dieldrin	1974	1	L0.000005	-	-
Endrin	1974	1	L0.00001	-	-
Heptachlor	1974	1	L0.000005	-	-
Methoxychlor	1974	1	L0.000005	-	-
Thiodan	1974	2	L0.00001	-	-
Phosphorus - total	1966-1974	29	0.086	L0.001	0.012
- ortho - dissolved	1967-1973	19	0.01	L0.002	0.004
<b>Polychlorinated Biphenyls:</b>					
Archlor 1248	1974	1	L0.0001	-	-
Archlor 1254	1974	1	L0.0001	-	-
Archlor 1260	1974	1	L0.0001	-	-
Potassium - total	1966-1974	60	1.9	0.4	0.75
Silica	1966-1974	55	12.7	1.1	9.4
Sodium - dissolved	1966-1974	59	5.5	1.3	3.3
Solids - total	-	-	-	-	-
- dissolved	1966-1970	7	157	49	106
- suspended	1966-1974	8	110	5	44.3
Specific Conductivity	1966-174	60	419	56	-
Sulphate	1966-1974	60	27.8	3.5	-
Temperature	1967-1970	34	23.3	0	-
Turbidity	1966-1974	59	61	0.1	-

\* All values are as mg/L except:

+ Median

L = Less Than

- (1) Colour
- (2) Specific Conductivity in uM/cm
- (3) Temperature in (°C)
- (4) Turbidity in NTU
- (5) pH

\*\* Data collected by Environment Canada

**TABLE 13**  
**Hedley Creek at Highway 3 Near Mouth (Station 0500032)**

Property		Period of Record	No. of Values	Values		
				Maximum	Minimum	Mean
Alkalinity	- total	1972-1979	18	49.5	9.8	23.5
BOD <sub>5</sub>		1973-1975	3	L10	L10	-
Carbon	- organic	1972-1979	20	14	1	6.6
Chloride		1972-1979	20	5.3	L0.5	0.92
Colour		1972-1978	17	50	5	21.2
Coliform	- fecal	1974-1979	4	5	L2	2+
Dissolved Oxygen		1973-1982	21	15.8	7.7	11.5
Percent Saturation		1973-1982	20	118.9	54.4	95.3
Fluoride		1972-1978	12	0.11	L0.1	0.1
Hardness	- total	1972-1975	3	69	20	39.5
	- Calcium	1972-1982	21	23.6	2.9	7.5
	- Magnesium	1972-1982	21	2.4	0.4	1
Metals:						
Aluminum	- dissolved	1982	3	0.03	L0.02	-
Arsenic	- dissolved	1982	3	L0.25	L0.25	-
Boron	- dissolved	1982	3	L0.01	L0.01	-
Cadmium	- dissolved	1972-1982	18	L0.01	L0.0001	-
	- total	1972-1978	3	L0.0005	L0.0005	L0.0005
Chromium	- dissolved	1972-1982	10	L0.01	L0.005	-
	- total	1976	1	L0.005	-	-
Cobalt	- dissolved	1982-1982	4	L0.1	L0.001	-
Copper	- dissolved	1972-1982	18	L0.01	L0.001	-
	- total	1972-1978	3	0.01	L0.001	-
Iron	- dissolved	1972-1982	16	0.3	0.07	0.14
	- total	1972-1978	3	4.39	0.1	1.6
Lead	- dissolved	1972-1982	15	L0.1	L0.001	-
	- total	1972-1978	3	0.003	L0.001	-
Manganese	- dissolved	1972-1982	18	0.02	L0.01	-
	- total	1972-1978	3	0.13	L0.02	-
Mercury	- total	1972-1979	12	L0.00005	L0.00005	L0.00005
Molybdenum	- dissolved	1974-1982	6	L0.01	L0.0005	-
Nickel	- dissolved	1972-1982	11	L0.05	L0.01	-
	- total	1972-1978	3	L0.01	L0.01	L0.01
Zinc	- dissolved	1972-1982	18	0.07	L0.005	0.011
	- total	1972-1978	3	0.11	L0.005	-
Nitrogen:						
Ammonia	- dissolved	1972-1982	17	0.046	L0.005	0.010
	- total	1971-1974	5	0.01	L0.01	-
Nitrate/nitrite		1972-1982	20	0.05	L0.02	0.023
Nitrate		1972-1982	14	0.02	L0.02	-
Nitrite		1972-1982	23	L0.005	L0.005	L0.005
Total Organic		1972-1982	22	0.36	0.05	0.14
Total Kjeldahl		1972-1982	24	0.41	L0.01	0.12
pH		1973-1982	29	7.9	7	7.6+

**TABLE 13 (Continued)**  
**Hedley Creek at Highway 3 Near Mouth (Station 0500032)**

Property	Period of Record	No. of Values	Values		
			Maximum	Minimum	Mean
Phosphorus - total	1972-1982	29	0.156	L0.003	0.015
- ortho - dissolved	1972-1978	10	0.004	L0.003	0.003
Potassium - dissolved	1972-1978	18	5.3	0.3	0.98
Silica	1972-1979	21	17.8	10	14.3
Sodium - dissolved	1972-1979	21	3.2	1.4	2.3
Solids - total	1972-1980	21	164	44	68
Specific Conductivity	1972-1982	28	89	23	53
Sulphate	1972-1979	21	24.5	L5	6.2
Temperature	1972-1982	31	17	0	6.7
Turbidity	1972-1982	20	33	0.2	2.3

\* All values are as mg/L except:

+ Median

L = Less Than

++ Data collected by Ministry of Environment.

- (1) Colour
- (2) Specific Conductivity in uM/cm
- (3) Temperature in (°C)
- (4) Turbidity in NTU
- (5) Percent Saturation in %
- (6) Fecal coliform as MPN/100 mL
- (7) pH

**TABLE 14**  
**Similkameen River Upstream of Keremeos (Station 0500692)**

Property		Period of Record	No. of Values	Values		
				Maximum	Minimum	Mean
Alkalinity	- total	1979	1	78.5	-	-
Carbon	- organic	1979-1981	4	3	L1	1.8
Chloride		1979	3	1.1	0.7	0.9
Coliform	- fecal	1979-1982	18	33	L2	5+
Dissolved Oxygen		1979-1982	15	16	8	11.2
Percent Saturation		1979-1982	15	130.1	80.5	100.5
Fluoride		1979	1	L0.1	-	-
Hardness	- Calcium	1979	2	20.6	14.6	-
	- Magnesium	1979	2	3.8	2.5	-
<b>Metals:</b>						
Arsenic	- dissolved	1979	1	L0.005	-	-
	- total	1979	1	L0.005	-	-
Boron	- dissolved	1979	2	L0.1	-	-
Cadmium	- dissolved	1979	1	L0.0005	L0.0005	-
Chromium	- dissolved	1979	2	L0.005	L0.005	-
Copper	- dissolved	1979	2	L0.001	L0.001	-
Iron	- dissolved	1979	2	L0.1	L0.1	-
	- total	1979	1	L0.1	-	-
Lead	- dissolved	1979	2	L0.001	L0.001	-
Manganese	- dissolved	1979	2	L0.02	L0.02	-
Mercury	- total	1979	2	L0.00005	L0.00005	-
Molybdenum	- dissolved	1979	2	0.019	0.0016	-
Zinc	- dissolved	1979	2	L0.005	L0.005	-
<b>Nitrogen:</b>						
Ammonia	- dissolved	1979-1982	22	0.015	L0.005	0.007
Nitrate/nitrite		1979-1982	22	0.15	L0.02	0.035
Nitrite		1979-1982	21	L0.005	L0.005	-
Total Kjeldahl		1979-1982	22	0.66	0.04	0.16
pH		1979-1982	22	8.4	7.5	8+
Phosphorus	- total	1979-1982	17	0.064	0.004	0.013
	- ortho - dissolved	1979	4	L0.003	L0.003	-
Silica		1979	1	10.5	-	-
Sodium	- dissolved	1979	2	3.4	2.8	-
Solids	- total	1979-1981	7	126	74	104.9
Specific Conductivity		1979-1982	16	280	90	155
Sulphate		1979	2	10.2	7	-
Sulphide		1979	2	L0.5	L0.5	-
Temperature		1979-1982	19	22	0	10.7
Turbidity		1979-1982	16	55	0.4	4.6

\* All values are as mg/L except:

+ Median

L = Less Than

++ Data collected by Ministry of Environment.

\* Median

- (1) Specific Conductivity in uM/cm
- (3) Temperature in (°C)
- (4) Turbidity in NTU
- (5) Fecal coliform as MPN/100 mL
- (6) Percent Saturation in %
- (7) pH

**TABLE 15**  
**Similkameen River Downstream of Keremeos (Station 0500693)**

Property		Period of Record	No. of Values	Values		
				Maximum	Minimum	Mean
Alkalinity	- total	1979	2	79.2	67	-
Carbon	- organic	1979-1981	4	2	L1	1
Chloride		1979	3	1.1	0.7	-
Coliform	- fecal	1979-1982	18	79	L2	4
Dissolved Oxygen		1979-1982	15	16.2	8.1	10
Percent Saturation		1979-1982	15	131	72	98
Fluoride		1979	1	L0.1	-	-
Hardness	- Calcium	1979	2	22.2	17.1	-
	- Magnesium	1979	2	4	2.5	-
<b>Metals:</b>						
Arsenic	- dissolved	1979	2	L0.005	L0.005	-
	- total	-	-	-	-	-
Boron	- dissolved	1979	2	L0.1	L0.1	-
Cadmium	- dissolved	1979	2	L0.0005	L0.0005	-
Chromium	- dissolved	1979	2	0.005	L0.005	-
Copper	- dissolved	1979	2	0.001	0.001	-
Iron	- dissolved	1979	2	L0.1	L0.1	-
	- total	1979	-	-	-	-
Lead	- dissolved	1979	2	0.001	L0.001	-
Manganese	- dissolved	1979	2	L0.02	L0.02	-
Mercury	- total	1979	2	L0.00005	L0.00005	-
Molybdenum	- dissolved	1979	2	0.0019	0.0016	-
Zinc	- dissolved	1979	2	0.03	L0.005	-
<b>Nitrogen:</b>						
Ammonia	- dissolved	1979-1982	22	0.024	L0.005	-
Nitrate/nitrite		1979-1982	22	0.1	L0.02	-
Nitrite		1979-1982	21	0.032	L0.005	-
Total Kjeldahl		1979-1982	22	0.34	0.05	-
pH		1979-1982	22	8.2	7.4	8+
Phosphorus	- total	1979-1982	17	0.058	0.005	-
	- ortho - dissolved	1979	4	L0.003	L0.003	-
Silica		1979	-	10.5	-	-
Sodium	- dissolved	1979	2	3.5	2.9	-
Solids	- total	1979-1981	7	122	78	104
Specific Conductivity		1979-1982	16	210	68	153
Sulphate		1979	2	10.2	8.1	-
Sulphide		1979	2	L0.5	L0.5	-
Temperature		1979-1982	19	21	0	10.3
Turbidity		1979-1982	15	50	0.6	5.2

\* All values are as mg/L except:

+ Median

L = Less Than

++ Data collected by Ministry of Environment.

\* Median

- (1) Specific Conductivity in uM/cm
- (3) Temperature in (°C)
- (4) Turbidity in NTU
- (5) Fecal coliform as MPN/100 mL
- (6) Percent Saturation in %
- (7) pH

**TABLE 16**  
**Keremeos Creek Near Mouth (Station 0500757)**

Property	Period of Record	No. of Values	Values		
			Maximum	Minimum	Mean
Alkalinity - total	1980-1981	2	105	60	82.5
Chloride	1980	1	1.2	-	-
Coliform - fecal	1981-1982	3	L2400	49	220+
Dissolved Oxygen	1980-1981	2	11.7	11.2	-
Percent Saturation	1980-1981	2	107.4	99.5	-
Fluoride	1980	1	0.11	-	-
Hardness - Calcium	1980-1981	3	43.1	22.8	34.6
- Magnesium	1980-1981	3	9	3.6	6.7
<b>Metals:</b>					
Copper - dissolved	1980	1	0.003	-	-
Iron - dissolved	1980	1	0.88	-	-
Lead - dissolved	1980	1	0.001	-	-
Manganese - dissolved	1980	1	0.03	-	-
Nickel - total	1980	1	L0.01	-	-
<b>Nitrogen:</b>					
Ammonia - dissolved	1980-1982	4	0.022	L0.005	0.010
Nitrate/nitrite	1980-1982	4	0.34	0.06	0.18
Nitrite	1980-1982	4	0.005	L0.005	-
Total Kjeldahl	1980-1982	4	0.36	0.04	0.20
pH	1980-1982	4	8.4	8	8.2+
Phosphorus - total	1980-1982	4	0.073	0.014	0.033
- ortho - dissolved	1980-1981	3	0.034	0.006	0.016
Potassium - dissolved	1980-1981	2	1.7	1.35	1.52
Silica	1980	1	12.3	-	-
Sodium - dissolved	1980	1	5	-	-
Solids - total	1980-1981	2	190	120	155
Specific Conductivity	1980-1982	4	330	156	228
Sulphate	1980	1	32.6	-	-
Temperature	1980-1982	3	13	7	10.7
Turbidity	1980-1982	4	12	0.7	4.9

\* All values are as mg/L except:

+ Median

L = Less Than

++ Data collected by Ministry of Environment.

- (1) Specific Conductivity in uM/cm
- (2) Temperature in (°C)
- (3) Turbidity in NTU
- (4) Percent Saturation in %
- (5) Fecal coliform as MPN/100 mL
- (6) pH

**TABLE 17**  
**Similkameen River Downstream from Cawston (Station 0500073)**

Property		Period of Record	No. of Values	Values		
				Maximum	Minimum	Mean
Alkalinity	- total	1972-1980	23	105	28.3	63
BOD <sub>5</sub>		1972-1973	4	110	110	-
Carbon	- organic	1972-1978	20	9	11	4.02
Chloride		1972-1978	23	2.2	0.6	1.02
Coliform	- fecal	1972-1982	6	130	12	3.5+
Colour		1972-1978	21	30	15	10.5
Cyanide		1974	1	10.01	-	-
Dissolved Oxygen		1972-1982	27	14.5	5.8	10.9
Fluoride		1972-1978	13	10.1	10.1	-
Hardness	- total	1972	1	91.6	-	-
	- Calcium	1972-1982	28	38	9.1	21.2
	- Magnesium	1972-1982	26	6	1.6	3.5
<b>Metals:</b>						
Aluminum	- dissolved	1982	3	0.04	10.02	-
Arsenic	- dissolved	1974-1981	4	10.05	10.005	-
Boron	- dissolved	1982	3	10.01	10.01	10.01
Cadmium	- dissolved	1972-1982	23	10.01	0.0002	-
	- total	1976	1	10.0005	-	-
	- hexitant	1972-1982	12	10.01	10.005	-
Chromium	- dissolved	1976	1	10.005	-	-
	- total	1972	1	0.005	-	-
Copper	- dissolved	1972-1982	24	0.11	10.001	0.009
	- total	1976-1980	2	0.004	10.001	-
Iron	- dissolved	1972-1982	26	0.44	0.01	0.09
	- total	1976-1980	1	0.8	-	-
Lead	- dissolved	1972-1982	19	10.1	10.001	-
	- total	1976-1980	2	0.003	0.001	-
Manganese	- dissolved	1972-1982	24	0.04	10.01	-
	- total	1976-1980	2	0.03	10.01	-
Mercury	- total	1972-1978	13	10.00005	10.00005	-
Molybdenum	- dissolved	1974-1982	7	10.01	10.0005	-
Nickel	- dissolved	1972-1982	17	10.05	10.01	-
	- total	1976	1	10.01	-	-
Zinc	- dissolved	1972-1982	21	0.08	10.005	-
	- total	1976-1980	2	0.006	10.005	-
<b>Nitrogen:</b>						
Ammonia	- dissolved	1974-1982	23	0.028	10.005	0.010
	- total	1972-1973	3	0.08	10.01	-
Nitrate/nitrite		1972-1982	23	0.13	10.02	0.04
Nitrate		1972-1982	17	0.07	10.02	0.03
Nitrite		1972-1982	26	0.017	10.005	-
Total Organic		1972-1982	26	0.6	0.02	0.16
Total Kjeldahl		1972-1981	29	0.38	0.02	0.014
pH		1973-1982	30	8.2	7.2	7.9+
Phosphorus	- total	1972-1982	34	0.331	0.004	0.045
	- ortho - dissolved	1972-1978	14	0.015	10.003	0.005
Potassium	- dissolved	1972-1981	23	2.7	0.6	0.97



**TABLE 17 (Continued)**  
**Similkameen River Downstream from Cawston (Station 0500073)**

Property	Period of Record	No. of Values	Values		
			Maximum	Minimum	Mean
Silica	1972-1981	22	14.4	7.4	10.5
Sodium - dissolved	1972-1978	22	5.9	2.1	3.4
Solids - total	1972-1980	25	372	68	144.5
- suspended	1972-1980	25	267	1	41.4
- dissolved	1972-1978	20	166	64	101
Specific Conductivity	1972-1982	52	250	59	144
Sulphate	1972-1980	26	28.7	L5	12.8
Temperature	1972-1982	37	19	0	7.7
Turbidity	1972-1982	16	55	0.4	6.7

\* All values are as mg/L except:

- (1) Colour
- (2) Specific Conductivity in uM/cm
- (3) Temperature in (°C)
- (4) Turbidity in NTU
- (5) Fecal coliform as MPN/100 mL
- (6) pH

+ Median

L = Less Than

++ Data collected by Ministry of Environment.

**TABLE 18**  
**Similkameen River 9 km North of U.S. Border (Station 8NL0005)**

Property		Period of Record	No. of Values	Values		
				Maximum	Minimum	Mean
Alkalinity	- total	1979-1982	18	85.9	30.3	65.2
BOD <sub>5</sub>		-	-	-	-	-
Carbon	- organic	1970-1976	49	11.5	0.9	3.4
Chloride		1979-1982	18	2	0.5	1.2
Coliform	- fecal	-	-	-	-	-
Colour		1979-1982	18	130	5	18
Cyanide		-	-	-	-	-
Dissolved Oxygen		-	-	-	-	-
Fluoride		1979-1982	18	0.1	0	0.1
Hardness	- total	1979-1982	18	97.1	32.7	73.1
	- Calcium	1979-1982	18	31.4	11.2	23.3
	- Magnesium	-	-	-	-	-
<b>Metals:</b>						
Aluminum	- dissolved	-	-	-	-	-
Arsenic	- dissolved	1979-1982**	18*8	0.0035**	0.0001**	0.0017
Boron	- dissolved	-	-	-	-	-
Cadmium	- dissolved	-	-	-	-	-
	- total	1979-1982**	5**	0.001**	0.0005**	0.000?
Chromium	- dissolved	-	-	-	-	-
	- total	-	-	-	-	-
	- hexavalent	-	-	-	-	-
Copper	- dissolved	-	-	-	-	-
	- total	1979-1982**	5**	0.004**	0.0011**	0.003**
Iron	- dissolved	-	-	-	-	-
	- total	1979-1982**	5**	0.32**	0.06**	0.212**
Lead	- dissolved	-	-	-	-	-
	- total	1981-1982**	5**	0.002**	0.001**	0.001**
Manganese	- dissolved	-	-	-	-	-
	- total	1981-1982**	5**	0.02**	0.01**	0.012**
Mercury	- total	1981-1982**	5**	0.00005**	0.00005**	0.00005**
Molybdenum	- dissolved	-	-	-	-	-
Nickel	- dissolved	-	-	-	-	-
	- total	-	-	-	-	-
Zinc	- dissolved	-	-	-	-	-
	- total	1979-1982**	5**	0.1**	-	-
<b>Nitrogen:</b>						
Ammonia	- dissolved	1970-1976	49	0.018	0.003	0.009
	- total	-	-	-	-	-
Nitrate/nitrite		1979-1982	18	0.31	0.002	0.038
Nitrate		-	-	-	-	-
Nitrite		-	-	-	-	-
Total Organic		-	-	-	-	-
Total Kjeldahl		-	-	-	-	-
pH		1979-1982	18	8.1	7.5	7.9+
Phosphorus	- total	1981-1982	4	0.042	0.004	0.021
	- ortho - dissolved	-	-	-	-	-
Potassium	- dissolved	1979-1982	18	2.2	0.5	0.9

**TABLE 18 (Continued)**  
**Similkameen River 9 km North of U.S. Border (Station 8NL0005)**

Property	Period of Record	No. of Values	Values		
			Maximum	Minimum	Mean
Silica	1979-1982	18	11.9	8.9	11
Sodium	1979-1982	18	7.1	1.8	7
Solids	- total	-	-	-	-
	- suspended	1979-1982	140	1	13
	- dissolved	1979-1982	136	64	113
		1979-1982	204	71	157
Specific Conductivity	1979-1982	18	21.5	4.5	12.9
Sulphate	1979-1982	17	16	1.5	8.2
Temperature	1979-1982	18	37	0.2	3.5
Turbidity	1979-1982	18			

\* All values are as mg/L except:

- (1) Colour
- (2) Specific Conductivity in uM/cm
- (3) Temperature in (°C)
- (4) Turbidity in NTU
- (5) Fecal coliform as MPN/100 mL
- (6) pH

+ Median

\*\* extractable

++ Data are courtesy of the Water Quality Branch of the Inland Waters Directorate

**TABLE 19**  
**Similkameen River at Oroville, U.S. (Station 49B070)**

Property	Period of Record	No. of Values	Values		
			Maximum	Minimum	Mean
Coliform - fecal	1977-1979	22	150	1	13
Colour	1977-1979	23	83	4	21
Dissolved Oxygen	1977-1979	23	15.2	8.1	11.9
Percent Saturation	1977-1979	23	120.9	93.9	104.3
<b>Metals:</b>					
Chromium - dissolved	1970-1979	28	0.010	0.0001	0.00193
Copper - dissolved	1970-1979	28	0.004	0.0001	0.00193
Lead - dissolved	1970-1979	28	0.011	0.001	0.0045
Mercury - total	1970-1979	28	0.0001	0.0001	0.0001
Zinc - dissolved	1970-1979	28	0.050	0.0001	0.00271
<b>Nitrogen:</b>					
Ammonia - total	1977-1979	23	0.08	0.01	0.03
Nitrate/nitrite	1977-1979	23	0.14	0.01	0.025
pH	1977-1979	23	8.4	7.6	7.9
Phosphorus - total	1977-1979	23	0.34	0.01	0.04
- ortho - dissolved	1977-1979	23	0.04	0.01	0.01
Solids - suspended	1977-1979	21	169	11	15.5
Specific Conductivity	1977-1979	23	290	70	173
Temperature	1977-1979	23	21.6	0	9.3
Turbidity	1977-1979	23	50	1	4.8

\*\* Data supplied by Washington State Department of Ecology

APPENDIX 5

Boundary Waters Treaty  
Canada and the United States

January 11, 1909



**APPENDIX 5**  
**BOUNDARY WATERS TREATY**  
**CANADA AND THE UNITED STATES**  
**JANUARY 11, 1909**

**Preliminary Article:** Defines boundary waters.

**Article I:** Navigable boundary waters (including Lake Michigan) free and open to both countries equally.

**Article II:** Each country reserves the exclusive jurisdiction and control over waters on its own side which flow across the border or into boundary waters. Laws of an interfering country apply to injured parties in the other country.

**Article III:** Cannot affect the level or flow of boundary waters without approval of the International Joint Commission (IJC).

**Article IV:** Cannot construct dams or other works on waters flowing from boundary waters, or on waters at a lower level than the boundary which flow across the boundary, which raise the level of waters on the other side of the border, except as allowed by the IJC.

Boundary waters and waters crossing the boundary shall not be polluted to cause injury on the other side.

**Article V:** Limit the diversion of waters from the Niagara River so the level of Lake Erie and the flow of the stream are not appreciably affected.

**Article VI:** The St. Mary and Milk rivers (Alberta, Saskatchewan and Montana) are to be treated as one stream for the purposes of irrigation and power.

**Article VII:** Establish an International Joint Commission (IJC), composed of six commissioners (three American; three Canadian).

**Article VIII:** The IJC shall have jurisdiction over and shall pass upon all cases with respect to Articles II and IV. Order of precedence for boundary waters:

1. Domestic and sanitary purposes;
2. Navigation (including service of canals) purposes; and
3. Power and irrigation purposes.

Exceptions to the previous articles may be approved by the IJC if adequate provision for protection and indemnity against injury on the other side of the boundary is made (eg. temporary diversions, raising water levels).

The majority of Commissioners shall have power to render a decision. In the event the IJC is evenly divided, the High Contracting parties shall reach an agreement.

**Article IX:** Other questions or matters of difference between the two countries along the boundary may be referred to the IJC. The IJC's decision in no way will have the character of an arbitral award. Reports to the two governments.

**Article X:** With the consent of both countries (consent of the Senate in the U.S.A.; consent of the Governor General in Council in Canada) the IJC shall have power to render a decision. If Commissions are equally divided, an umpire may be chosen in accordance with the Hague Convention for the settlement of international disputes (1907).

**Article XI:** A duplicate original of all decisions and reports of the IJC shall be filed with the Secretary of State (USA) and the Governor General (Canada).

**Article XII:** Organization of the IJC.

**Article XIII:** Defines "special agreements" referred to in the preceding articles.

**Article XIV:** Treaty Ratification. It remains in force for five (5) years, and thereafter until terminated by twelve (12) months written notice given by either High Contracting Party.



APPENDIX 6

Additional NEPA Information



# Potential and Producing Mines

**LEGEND**

- PROVINCIAL PARK (hatched area)
- P.S.Y.U. BOUNDARY (dashed line)
- POTENTIAL MINE (triangle)
- PRODUCING MINE (circle)

**Map Labels:**

- Geographic Features:** Ashcroft, Similkameen, P.S.Y.U., Nickel Plate, Hedley, Mascot, Banbury, Newmont, Dancoe, Oroville, Palmer Lake, Omineca River, Silver River, B.C., Washington, Oroville.
- Lakes:** Allison Lake, Otter Lake, Cedar Lake, Cypress Lake, Princeton, Newmont, Dancoe, Oroville, Palmer Lake.
- Rivers and Creeks:** Allison River, Otter River, Cedar River, Cypress River, Princeton River, Newmont River, Dancoe River, Oroville River, Silver River, Omineca River.
- Boundaries:** P.S.Y.U. Boundary, Provincial Park Boundary.

**Scale:** 0 to 40 Kilometres

**Source:** Inland Water Directorate, 1983

**D. Sherwood,**  
**Source: Inland Water Directorate, 1983**



**D. Sherwood,**  
**Source: Inland Water Directorate, 1983**

OKANOGAN CO PUD

HYDRO-CALC

ENLDE-MAXIMUM DEVELOPMENT

DATE: 06/01/85

EXCEEDENCE CURVE INPUT

PERCENT	FLOW RATE (CFS)
10	7000
20	5000
30	1500
40	1050
50	760
60	600
70	520
80	450
90	400
100	100

COMMENTS:

6/1/85  
2:7

2/11

LEAST SQUARES FIT OF DATA IS

$$Y = A * X^B$$

WHERE:

$$A = 260.985705$$

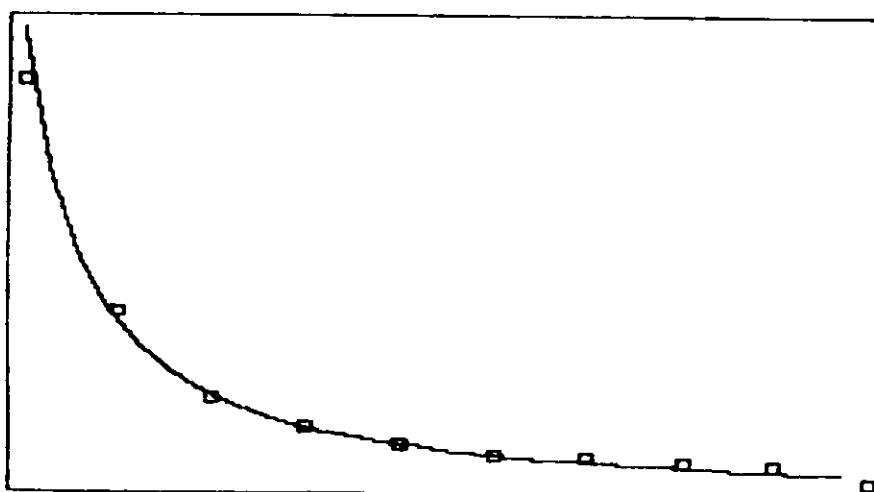
$$B = -1.48173418$$

$$R^2 = .941559219$$

SUMMARY FOR  $Y = A * X^B$

X ACT	Y ACT	Y CALC
.1	7000	7917.18
.2	3000	2833.38
.3	1500	1553.76
.4	1050	1014.51
.5	760	728.89
.6	600	556.34
.7	520	442.73
.8	450	363.25
.9	400	305.08
1	130	260.99

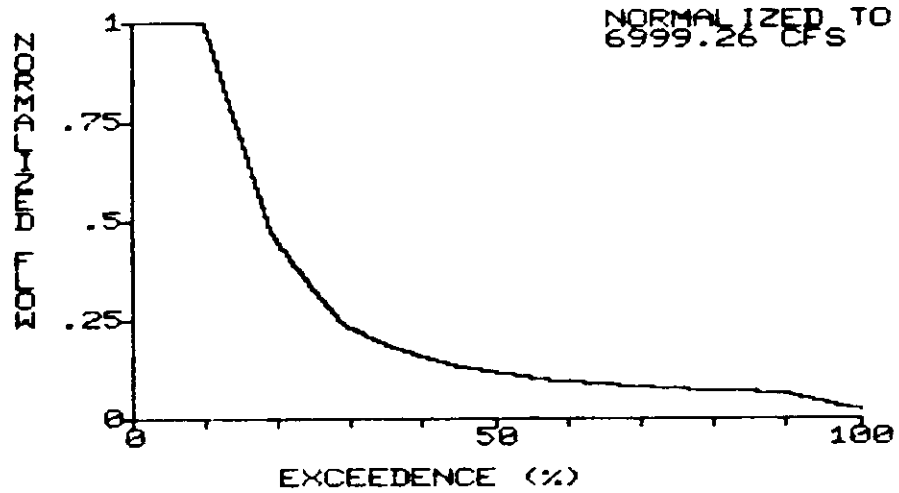
COMPARISON OF FIT WITH DATA:



6/1/85

THE INPUT DATA IS USED FOR THIS  
ANALYSIS

THE CALCULATED AVERAGE YEARLY FLOW  
RATE IS 1885.2 CFS.  
---MODIFIED TO 1885 CFS



EXCEEDENCE		FLOW	
0	%	6999.3	CFS
5	%	6999.3	CFS
10	%	6999.3	CFS
15	%	4999.5	CFS
20	%	3116.6	CFS
25	%	2249.8	CFS
30	%	1585.8	CFS
35	%	1274.9	CFS
40	%	1066.7	CFS
45	%	904.9	CFS
50	%	775.1	CFS
55	%	679.9	CFS
60	%	609.3	CFS
65	%	559.9	CFS
70	%	521	CFS
75	%	484.9	CFS
80	%	451.6	CFS
85	%	425	CFS
90	%	389.7	CFS
95	%	265	CFS
100	%	130	CFS

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267

RUN 1 - NO ENCROACHMENT, NO BY-PASS

## TURBINE #1

## VARIABLE PITCH WITH WICKET GATES

AVAILABLE HEAD	80	FT
EXC %		
RATED	84	TURB. CFS RIVER CFS
CUTOFF	100	430 430
MINIMUM	100	130 0
---		
GENERATOR EFF.	90	%
RATED POWER	2284.02	KW
ANNUAL ENERGY	19255771	KWH
PLANT FACTOR	96.2	%

## •TURBINE #2

## VARIABLE PITCH WITH WICKET GATES

AVAILABLE HEAD	80	FT
EXC %		
RATED	46.5	TURB. CFS RIVER CFS
CUTOFF	67.8	430 860
MINIMUM	84	107.5 537.5
---		430
GENERATOR EFF.	90	%
RATED POWER	2284.02	KW
ANNUAL ENERGY	11610941	KWH
PLANT FACTOR	58	%

6/1/95

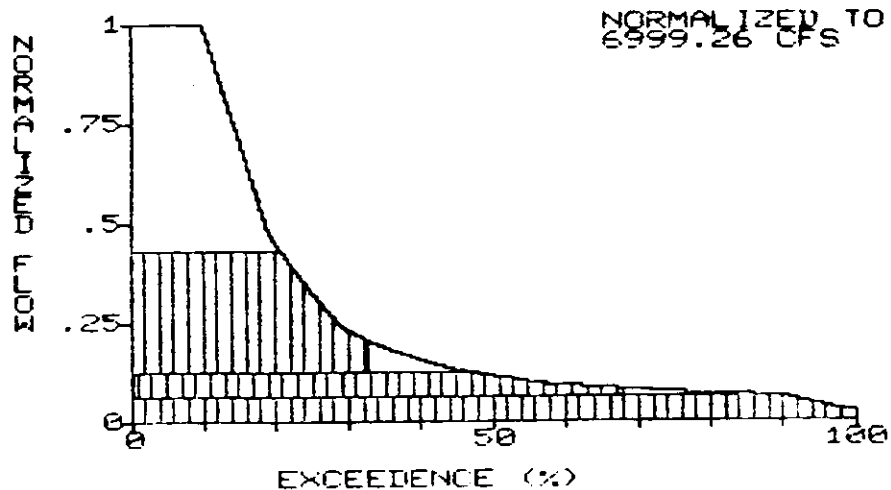
117



TURBINE #3

VARIABLE PITCH WITH WICKET GATES

AVAILABLE HEAD	80	FT
EXC %	TURB. CFS	RIVER CFS
RATED 20.6	2150	3010
CUTOFF 32.9	507.5	1397.5
MINIMUM 46.5	---	860
GENERATOR EFF.	90	%
RATED POWER	11420.1	FW
ANNUAL ENERGY	28017.613	FWH
PLANT FACTOR	28.3	%
TOTAL ENERGY	59184.226	FWH
OVERALL P.F.	42.3	%



6/1/35

6/11

RUN 2 - 7' TAILWATER ENCROACHMENT  
W/NO BYPASS

TURBINE #1

VARIABLE PITCH WITH WICKET GATES

AVAILABLE HEAD	73	FT	
	EXC %	TURB. CFS	RIVER CFS
RATED	84	430	430
CUTOFF	100	130	130
MINIMUM	100	---	0
GENERATOR EFF.	90	%	
RATED POWER	2084.17	KW	
ANNUAL ENERGY	17,570,891	KWH	
PLANT FACTOR	96.2	%	

TURBINE #2

VARIABLE PITCH WITH WICKET GATES

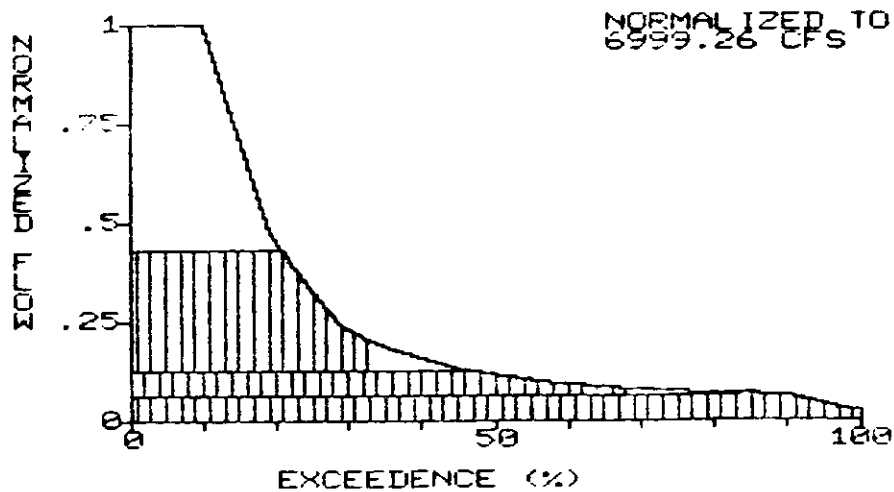
AVAILABLE HEAD	73	FT	
	EXC %	TURB. CFS	RIVER CFS
RATED	46.5	430	860
CUTOFF	67.8	107.5	537.5
MINIMUM	84	---	430
GENERATOR EFF.	90	%	
RATED POWER	2084.17	KW	
ANNUAL ENERGY	10,594,983	KWH	
PLANT FACTOR	58	%	

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TURBINE #1

VARIABLE PITCH WITH WICKET GATES

AVAILABLE HEAD	73	FT
EXC %		
RATED	20.6	TURB. CFS RIVER CFS
CUTOFF	31.8	2150 3010
MINIMUM	46.5	537.5 1097.5
		---
GENERATOR EFF.	90	%
RATED POWER	10421.84	KW
ANNUAL ENERGY	25809900	KWH
PLANT FACTOR	28.3	%
TOTAL ENERGY	54005198	KWH
OVERALL P.F.	42.3	%



RUN 3 - 7' TAILWATER ENCROACHMENT  
 \$ 100 CFS OF BYPASS

TURBINE #1

VARIABLE PITCH WITH WICKET GATES

AVAILABLE HEAD	73	FT
EXC %		
RATED	68.8	TURB. CFS 430 RIVER CFS 530
CUTOFF	97.1	107.5 207.5
MINIMUM	100	--- 100
GENERATOR EFF.	90	%
RATED POWER	2084.17	KW
ANNUAL ENERGY	16,326,051	KWH
PLANT FACTOR	89.4	%

TURBINE #2

VARIABLE PITCH WITH WICKET GATES

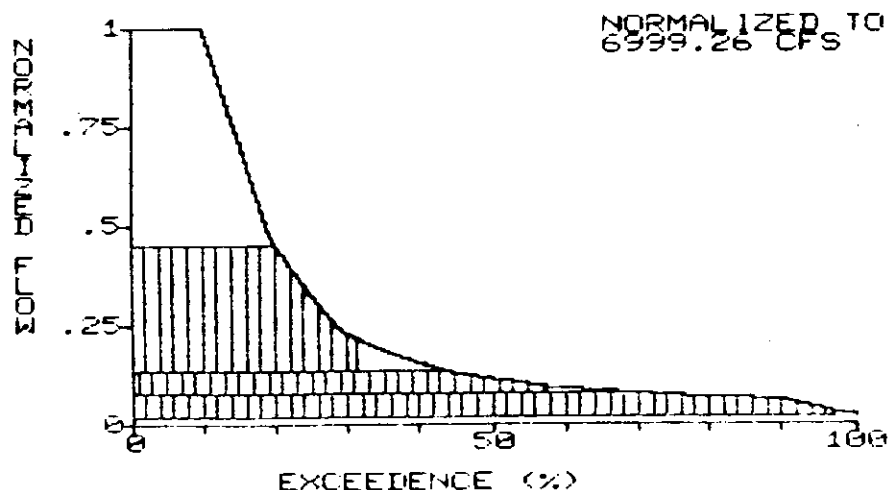
AVAILABLE HEAD	73	FT
EXC %		
RATED	43.1	TURB. CFS 430 RIVER CFS 960
CUTOFF	57.7	107.5 637.5
MINIMUM	68.8	--- 530
GENERATOR EFF.	90	%
RATED POWER	2084.17	KW
ANNUAL ENERGY	9,299,359	KWH
PLANT FACTOR	50.9	%

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TURBINE #3

VARIABLE PITCH WITH WICKET GATES

AVAILABLE HEAD	73	FT
EXC %		
RATED	20	TURB. CFS RIVER CFS
CUTOFF	31.3	2150 3110
MINIMUM	43.1	577.5 1497.5
		950
GENERATOR EFF.	90	%
RATED POWER	1042.64	KW
ANNUAL ENERGY	24804849	KWH
PLANT FACTOR	27.2	%
TOTAL ENERGY	50400150	KWH
OVERALL P.F.	19.5	%



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10/11

RUN 4 - NO ENCROACHMENT

~~4~~/100 CFS OF BYPASS

TURBINE #1

VARIABLE PITCH WITH WICKET GATES

AVAILABLE HEAD	80	FT
	EXC %	TURB. CFS RIVER CFS
RATED	68.8	430 530
CUTOFF	97.1	107.5 207.5
MINIMUM	100	--- 100
GENERATOR EFF.	90	%
RATED POWER	2284.02	KW
ANNUAL ENERGY	17891563	KWH
PLANT FACTOR	89.4	%

TURBINE #2

VARIABLE PITCH WITH WICKET GATES

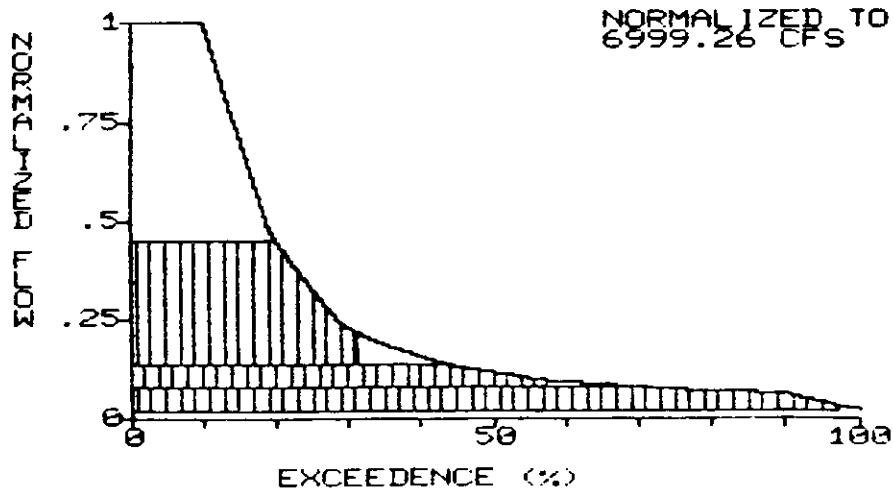
AVAILABLE HEAD	80	FT
	EXC %	TURB. CFS RIVER CFS
RATED	43.1	430 960
CUTOFF	57.7	107.5 637.5
MINIMUM	68.8	--- 530
GENERATOR EFF.	90	%
RATED POWER	2284.02	KW
ANNUAL ENERGY	10191078	KWH
PLANT FACTOR	50.9	%

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PH

TURBINE #3

VARIABLE PITCH WITH WICKET GATES

AVAILABLE HEAD	80	FT
EXC %		
RATED	20	TURB. CFS RIVER CFS
		2150 3110
CUTOFF	31.3	537.5 1497.5
MINIMUM	43.1	--- 960
GENERATOR EFF.	90	%
RATED POWER	11420.1	KW
ANNUAL ENERGY	27183396	KWH
PLANT FACTOR	27.2	%
TOTAL ENERGY	55266038	KWH
OVERALL P.F.	39.5	%



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RUN #5 - NO ENCROACHMENT

W/ 40 CFS OF BYPASS

TURBINE #1

VARIABLE PITCH WITH WICKET GATES

AVAILABLE HEAD	80	FT	
	EXC %	TURB. CFS	RIVER CFS
RATED	77.2	430	470
CUTOFF	99.4	107.5	147.5
MINIMUM	100	---	40
GENERATOR EFF.	90	%	
RATED POWER	2284.02	KW	
ANNUAL ENERGY	18642997	KWH	
PLANT FACTOR	93.2	%	

TURBINE #2

VARIABLE PITCH WITH WICKET GATES

AVAILABLE HEAD	80	FT	
	EXC %	TURB. CFS	RIVER CFS
RATED	45.2	430	900
CUTOFF	62.8	107.5	577.5
MINIMUM	77.2	---	470
GENERATOR EFF.	90	%	
RATED POWER	2284.02	KW	
ANNUAL ENERGY	10900782	KWH	
PLANT FACTOR	54.5	%	



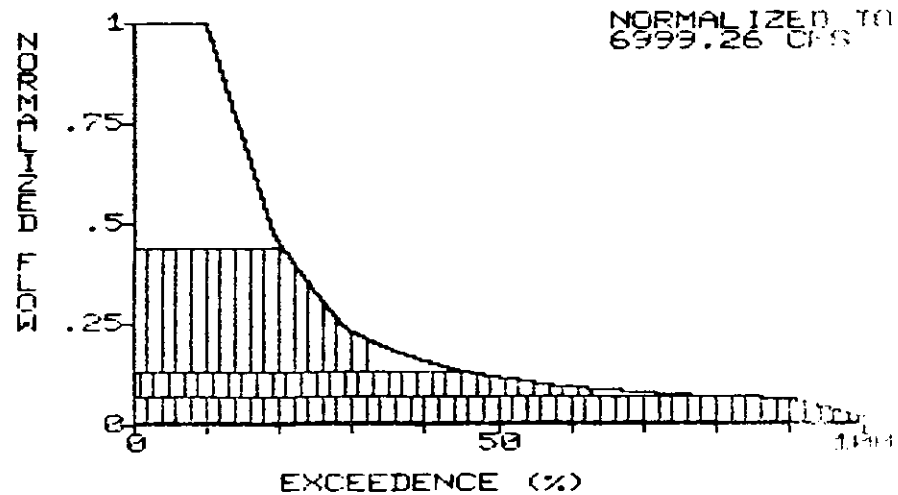
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TURBINE #5

VARIABLE PITCH WITH WICKET GATES

AVAILABLE HEAD	80	FT
	EXC %	TURB. CFS RIVER CFS
RATED	20.4	2150 3050
CUTOFF	32.2	537.5 1437.5
MINIMUM	45.2	--- 900
GENERATOR EFF.	90	%
RATED POWER	11420.1	KW
ANNUAL ENERGY	27863926	KWH
PLANT FACTOR	27.9	%
TOTAL ENERGY	57407706	KWH
OVERALL P.F.	41	%



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RUN #6 - W/ 7' OF ENCROACHMENT

± W/ 40 CFS OF BYPASS

TURBINE #1

VARIABLE PITCH WITH WICKET GATES

AVAILABLE HEAD	73	FT	
	EXC %	TURB. CFS	RIVER CFS
RATED	77.2	430	470
CUTOFF	99.4	107.5	147.5
MINIMUM	100	---	40
GENERATOR EFF.	90	%	
RATED POWER	2084.17	KW	
ANNUAL ENERGY	17,011,735	KWH	
PLANT FACTOR	93.2	%	

TURBINE #2

VARIABLE PITCH WITH WICKET GATES

AVAILABLE HEAD	73	FT	
	EXC %	TURB. CFS	RIVER CFS
RATED	45.2	430	900
CUTOFF	62.8	107.5	577.5
MINIMUM	77.2	---	470
GENERATOR EFF.	90	%	
RATED POWER	2084.17	KW	
ANNUAL ENERGY	9,946,963	KWH	
PLANT FACTOR	54.5	%	

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267

4/4

# TURBINE #7

## VARIABLE PITCH WITH WICKET GATES

AVAILABLE HEAD	73	FT	
	EXC %	TURB. CFS	RIVER CFS
RATED	20.4	2150	3050
CUTOFF	32.2	537.5	1437.5
MINIMUM	45.2	---	900
GENERATOR EFF.	90	%	
RATED POWER	10420.94	FW	
ANNUAL ENERGY	25425833	KWH	
PLANT FACTOR	27.9	%	
TOTAL ENERGY	52384532	KWH	
OVERALL P.F.	41	%	

